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Getting Ready for Winter

In contrast with much railway work, that of the maintenance of way department is seasonable in character. Because of this fact its nature changes from month to month. Thus the time is now at hand when it is necessary to close up the major season of the activities and get the track and structures in condition to withstand the demands of winter traffic and the rigors of winter weather. In some ways the roads will enter this winter under less favorable conditions than usual. This is particularly true of the track which in most instances is in a weakened condition because of the failure to make the normal renewals. The amount of rail relaid during the last two years is considerably below the average of the test period, which in turn is somewhat below that of the ten-year period. Tie renewals are also somewhat below normal, although the present deficiency in this respect is not as great as it was a few months ago. Likewise, ballast has not been renewed as freely as in the past. All of these tendencies have contributed to the weakening of the track structure, lessening its ability to resist the destructive effects of traffic and of weather during the winter when little work can be done on it. Furthermore, much work such as ditching has been neglected for the more pressing problem of maintaining line and surface and deficiencies such as this will exact their toll. Not the least unfavorable influence, particularly in some quarters, is the lessened efficiency and dependability of labor, which may react unfavorably under the stress of winter storms. This condition, however, is not general, for in some localities an improvement has been effected in the class of employees. The supervisor or foreman to whom winter has the least terror is the one who is forehanded and who has made preparations with full knowledge of the conditions which may confront him. Many precautions such as the clearing of culverts, and the amplifying of the drainage about switches are followed by almost all foremen. Other expedients are practiced only by the more careful men who endeavor to anticipate the ravages of the colder period. Track men in all capacities should give this subject careful consideration in order that they may be able to anticipate all reasonable developments and avoid emergencies, most of which usually come from failure to prepare adequately for expected events.

Change in Convention Date

Officers of the bridge and building department will be interested in learning of the change in the date of meeting of the Maintenance of Way Master Painters' Association, which for the first time in many years will not conflict with the date of the convention of the American Railway Bridge and Building Association. Owing to the fact that these two associations, with work overlapping to a certain extent, have both held their meetings on the week of the third Tuesday in October, not a few railroad men and supply men who desired to attend both conventions were compelled to forego attendance at one or the other. There were those who have contended that the two associations

should amalgamate, but owing to a considerable difference in the personnel it has been felt that one organization could not serve the purposes of both for all of the members of each. The problem has now been solved by a change in the date of the Master Painters' convention, so that it will be held next year at Detroit on October 6, 7 and 8, whereas the Bridge and Building convention will meet at Atlanta, Ga., on October 20, 21 and 22.

PLACE THE ORDERS NOW

THE TWO materials used in the largest quantities in the maintenance of the fixed properties of the railroads are rails and ties. At the time the roads were taken over the upkeep had of necessity been curtailed heavily. The renewal of rails aggregated approximately 1,233,000 tons in 1917, as compared with an annual average for the preceding ten years of 1,600,000 tons. The renewal of ties had been similarly retarded. Early in the period of federal control the purchase of both rails and ties was taken over by the Railroad Administration and since that time the individual roads have received these materials by distribution from the central purchasing division. At the beginning of federal control there was a relatively large tonnage of rails on order on which the mills were engaged more or less actively until the middle of the past summer, 435,000 tons being still outstanding on old orders as late as May 1 of this year. Owing very largely to war-time conditions only 1,097,000 tons of rails were laid in 1918, while the tonnage laid this year has been even less, so that the deficiency in the renewal of rails has continued to increase. To date the Railroad Administration has ordered only 200,000 tons of rails on its own account and these have largely been rolled, so that the orders standing on the books of the mills and still unrolled are relatively small. While the Railroad Administration asked for bids on an additional 200,000 tons a couple of months ago, recent indications are that this order will not be placed.

The situation with reference to ties is at least equally serious. During 1918 the tie producing industry was seriously demoralized, with the result that the production decreased greatly. While this has been overcome in a large measure in recent months so that the output of ties during 1919 will be nearly normal, no progress will be made in making up the shortages of last year and of the period preceding the inauguration of federal control.

Both ties and rails are necessarily placed on order well in advance of the date of delivery. This is particularly desirable in order that these materials may be received and distributed along the lines during the late winter months ready for insertion in the tracks as soon as the frost leaves the ground in the spring. A large part of the orders for these materials is, therefore, commonly placed long before this season of the year. However, at the present time no such steps have been taken. The authority to purchase these materials has been taken from the roads and concentrated in the central purchasing division.

Now, owing to the impending termination of federal control, the Railroad Administration hesitates to place orders for materials which will be delivered after the roads are returned to their owners. At the same time it has not relinquished its authority over these purchases or instructed the railroads that they can proceed on their own account. It is understood that the purchasing division hesitates to give up control over purchases because of the possibility that the roads may not be returned to their owners at the end of the year, although the director general has been very specific in his statements that this action will be taken. It is vital to the adequate maintenance of the roads that arrangements be made whereby the necessary materials may be ordered at the earliest possible date in order that the producers can work upon them and deliveries be assured next spring. The Railroad Administration should either order these supplies on its own account or permit the owners to do so. To delay further will be disastrous.

NEW DEVELOPMENTS—A RESPONSIBILITY

THE MOST fascinating thing about the work of the maintenance of way department is the fact that it is a live process that can thrive only as it is allowed to grow. The conduct of the maintenance of way associations and the publication of periodicals such as this are only possible through the development of new ideas which warrant general dissemination through the entire body of officers responsible for the prosecution of this important work. A large part of the pioneer development in the evolution of new ideas is done by a small body of scientific men and practical experts in the employ of the railroads and the manufacturers, but the general application of their studies in a manner that will accrue to the general good of the railroads is made possible only through a wholehearted co-operation by all maintenance of way men. New devices must be subjected to severe tests, not only to determine their basic worth, but also to find out what changes of design are necessary to make them thoroughly successful.

Few maintenance officers realize fully the important influence they can exert in retarding or accelerating the success of a new idea through the part they play in its development. The young supervisor, through lack of technical training or experience, or both, is often inclined to look at the new idea from too narrow a viewpoint. If the device does not prove entirely successful when used according to the prevailing method of doing the work, it does not occur to him that perhaps the method might be changed to suit the operation of the device, or that the device might work much better if subjected to slight improvement in design. As an illustration of a short-sighted condemnation of a new idea, a paint foreman was recently heard to criticise the spray method of painting, when on inquiry it was found that his opinion was based on an unsuccessful experience with a machine he had borrowed from the mechanical department of his road without taking the trouble to become thoroughly advised as to the correct method of applying it. A roadmaster not long ago condemned the use of concrete slabs as a means of obtaining better foundations for railroad crossings, when it was learned merely by chance that his experience was based on laying the ties directly on the slabs, whereas the other track supervisors with whom he was discussing the subject were referring to installations in which the ties were carried on ballast as in ordinary track construction.

The man responsible for the actual conduct of the work is very much inclined to assume that the cost and ease of installation are of the foremost importance and consider life or ultimate economy as purely secondary. Thus in a discussion of fence posts several roadmasters apparently based their conclusions on the relative ease with which the posts could be set without any thought of their relative life. Most maintenance of way men, however, fall into the more common error of over-enthusiasm, which accounts perhaps for the seeming over-conservatism of the higher officers. In considering the savings of labor accomplished by a given machine, the supervisor may overlook the train service charge or the fixed charges

accruing on the cost of a device which is used only a small portion of the time.

The lesson of all this is that any innovation must be considered with a full knowledge of all the facts involved and with a due regard for correct economic principles. An attempt to exploit any device under artificial conditions can have but one of two results: it will either effect a delay in the ultimate failure of the device or it will serve to put off a recognition of the necessary modifications required to make it a real success. There is a growing need for the introduction and perfection of labor-saving devices of all kinds and officers of the maintenance of way department cannot afford to delay their ultimate success either through an enthusiastic over-optimism or an unwarranted pessimism.

THE PIPED RAIL PERIL

THE STORY entitled "Never Again" which is published on another page contains a warning for section foremen against allowing piped rails to remain in the track. The warning is timely, and the emphasis on the importance of prompt action merits the readers' serious consideration. A pipe may develop soon after a new rail is laid in the track, or it may not show until the rail has been under traffic for several years, depending on its depth beneath the surface and on the wheel loads, for the true pipe is due essentially to segregation of metal in the web of the rail. A crushed head may result from overloading a rail in which no segregation exists, but there seems to be no sure way of distinguishing between the two defects until the rail has failed. A true pipe is indicated by the smooth, dark surfaces of an internal fold or crack. The first outward indication of a pipe or crushed head is a narrow, dark streak usually several feet long in the bright surface of the crown of the rail, known to trackmen as a black seam, caused by depression of the metal. The ball of the rail gradually crushes half way between the ends of the seam until it widens perceptibly and develops a flat spot, under which the metal of the ball cracks away from the web on one side or the other sooner or later. The black seam of a true pipe is usually directly over the web, while in the case of a crushed head without segregation the black seam is a little to one side of the web, and the break has bright edges. Failure is usually preceded by the appearance of a fine crack, resembling a streak of rust, close to the web of the rail in the upper angle under the ball, but these signs of gradual failure are not always present or apparent to even the closest and most experienced observer. A rail may show a black seam and carry traffic for a year, or it may go to pieces under the wheels of the next train without any noticeable spread of the ball, or one side of the ball may split off the web of a rail which showed no preliminary cracking.

There seems to be no way to tell how long a piped rail or one with a crushed head will last, nor is there any justification for placing the slightest dependence in such defective material. The trackman's only course is to replace the defective rail at once with a sound rail. Of the two defects a piped rail is more dangerous to trains than a broken rail. An observing pedestrian will often see a broken rail, sense the danger, and act promptly to prevent a possible wreck, but few persons excepting experienced trackmen know a piped rail when they see it, and fewer still realize the danger that lurks beneath the long black seam in an otherwise perfectly good looking rail. This, then, is one of the many heavy responsibilities of the section foreman; to inform himself daily of the condition of his rail, and to change out a black-seamed rail as soon as it is discovered.

LETTERS TO THE EDITOR

HELP REDUCE THE HIGH COST OF RAILROADING

Brewster, Ohio.

TO THE EDITOR:—

While we are raising a great hue and cry against the high cost of living, it might be well for us to give a thought to the high cost to our employers who operate the railroads. Every employee should use and handle material as conservatively as he would desire it to be handled were he paying for it out of his own pocket. In the maintenance of way department a special effort should be made to use material as long as it is fit for use. Don't throw away a track spike simply because it is slightly bent, a fault that can readily be remedied by a blow or two of a hammer. Don't knock the head out of a keg of spikes or bolts, dump them on the ground and after using a few of them, leave the balance to become covered up with dirt and lost.

Carpenters should select a piece of lumber that will cut to the required size with as little waste as possible, and not saw a small piece from the middle of a board to patch a hole and then throw the rest of the board away; this would be about as practical as for the carpenter's wife to cut a slice from the middle of a loaf of bread and then throw away the remainder. Do not waste material by drawing more from the stock room than will be used and then leave the surplus where the work was done or throw it away. If the point of a chisel breaks, don't swear and throw it away, but turn it in for repair; the man making the repairs should use every precaution to dress it properly. Then the next workman who uses it will not be tempted to fracture any of the ten commandments and be compelled to leave his work and walk ten or twelve car lengths for another, thereby wasting enough time to dress a half dozen of them properly.

Scrap material should not be thrown over the dump or buried, but should be collected in piles so that it may be loaded readily by a scrap train. Bear in mind that scrap iron and steel is now worth as much as new material cost a few short years ago, and at the present high prices the equivalent of a month's wages can soon be wasted in this manner. W. H. LEWER.

THE DRAINAGE OF TRACK

Gassaway, West Va.

TO THE EDITOR:

"Keep water away from the roadbed" should be the motto of every trackman. Nothing will ruin good track as quickly as water and nothing will make track stay good as long as proper drainage. Every trackman knows that it is impossible to keep track in first-class condition where there is not proper drainage. For this reason it is work wasted to put track up in good shape unless the roadbed is so drained that the water will be carried away from beneath the ties promptly.

Water under the ties softens the mass and the weight of passing trains forces the ties deeper and deeper into the ballast until low joints are formed, which, in turn, cause rough riding, swinging of cars, bending of rails, breaking of angle bars, and often derailments.

All ditches should have sufficient slope to carry the water away at such a rate that little will be absorbed by the roadbed. Water boxes should be used wherever they

will hasten the removal of water from the track, for one water box properly placed will often prevent several "pumping" joints.

In soft places stone ballast is often used where cinders would be better. This form of ballast crushes into the mud and forms a mass that holds water and brings on a "pumpy" sog, while cinders leave a more porous bed and allow the water to drain off. The foreman can often remedy bad wet cuts by using intelligence.

As far as possible ditching and draining should be done before bad winter weather sets in, as it can be done much cheaper and better at this time, and when the rainy and snowy days come on it will leave the roadbed dry.

Money spent on ditching and drainage is well spent and it does not take very long for a good ditching machine to pay for itself. Nothing saves so much needless work for the trackman as proper methods for keeping water away from his roadbed.

Every trackman should watch water unrelentingly and treat it as his greatest foe. In getting rid of it he is eliminating the thing that causes the greatest deterioration in his track.

C. H. CARPENTER,
Baltimore & Ohio.

A PLEA FOR STANDARDIZATION

Albany, N. Y.

TO THE EDITOR:

In view of the ever-increasing cost of railway maintenance throughout the world it is necessary that steps be taken to overcome this tendency. Much has already been done in this line. Economies are being introduced to a greater extent than ever. The reclamation of scrap and the sale of every bit of worn-out steel used, from spikes to locomotives, have helped wonderfully. However, still other plans can be introduced or extended.

As maintenance men know, standardization is a great factor in reducing maintenance expenditures if carried out properly. For example, it is possible to limit purchases to one design of railroad track spike, three angles of frogs for yard or main line work, such as No. 9 frogs for yards, No. 10 for ordinary main line crossovers and No. 12 for moderate speed special main line crossovers; one frog of a smaller number could also be used to advantage for industrial and sharp terminal leads. We can buy only one style of switch stand for yards and another for main line. We could have all rails of one design of section and eleminate all other sections. Angle bars, insulated joints, etc., could be bought in one style instead of several. In other words, we should eliminate all excess standards and materials and have as few practices, methods and makes of material as possible.

A further gain would come from the elimination of three-tie joints and six-hole angle bars, saving one tie, two spikes, two bolts and also some steel in the angle bar for each joint. A two-tie suspended joint, well tamped, with four-hole angle bars and extra large bolts suits the purpose as well, for in a great number of cases the joint tie is little tamped and pumps in the track, making a longer suspended joint than even a two-tie joint.

If such a practice of standardization is carried out throughout the country, methods and materials would be much simplified in a few years. These adjusted standards could be given to the manufacturers and the work distributed equally, so as to protect them and their patents, using only the best of existing patterns and makes in the production of the needed devices.

In conclusion, I say simplify and standardize maintenance materials and methods nationally, or, if not nationally, by systems. Every road can do much in this direction, the United States Railroad Administration can do more.

CHARLES B. WILLIAMS.

NEW BOOKS

Annual Statistical Report of the American Iron & Steel Institute. 6 in. by 9 in., 90 pages, non-illustrated. Published by the American Iron & Steel Institute, 61 Broadway, New York.

This is the seventh annual report issued by the American Iron & Steel Institute and contains statistics of iron and steel and allied industries in the United States and Canada for the year 1918 and preceding years. As in former years special statistical bulletins have been issued from time to time during the year containing advance reports covering such phases of the industry as the production of pig iron, the production of rails, etc. Information contained in the preliminary reports together with a large amount of additional material is compiled in this annual report.

Proceedings, American Wood Preservers' Association, 1919. 6 in. by 9 in., 310 pages, illustrated. Published by the American Wood Preservers' Association, F. J. Angier, secretary-treasurer, Mount Royal Station, Baltimore, Md.

This book contains the committee reports and papers presented at the fifteenth annual meeting of the American Wood Preservers' Association held at St. Louis on January 28 and 29, 1919, together with a running report of this convention. Among matters of special interest presented at this meeting were studies of the preservative situation, with particular reference to the scarcity of creosote, opportunities for preservation of timber used in car construction, and specifications of the United States Railroad Administration for ties and for the preservative treatment of timber. The last 40 pages of the text consists of statistical data prepared by the United States Department of Agriculture, Office of Forest Products, in co-operation with the American Wood Preservers' Association. These include tables and diagrams on the quantities of ties, piles, poles, etc., subjected to various forms of treatment, figures on the quantities of preservatives used, etc In the case of ties data are given on the quantities of sawed and hewed ties, the number treated with creosote, with zinc chloride, etc., and the principal woods, etc.

Forest Products, Their Manufacture and Use. By Nelson Courtlandt Brown, professor of Forest Utilization, New York State College of Forestry, Syracuse, N. Y. 472 pages, 120 illustrations, 6 in. by 9 in., bound in cloth. Published by John Wiley & Sons, Inc., New York City.

As its name indicates, this book describes the commercial processes involved in the utilization of the more important forest products, other than lumber, in the United States. It contains a large amount of statistical and general information concerning the quantities of timber available in various forms and describes the manner in which it is converted into commercial products. It is therefore a valuable book of reference in a field in which comparatively little has been written. Much of the information was obtained through personal investigation by the author in various parts of the United States and Europe, he having been a trade commissioner with the United States Lumber Trade Commission to Europe. Because of the abnormal and more or less temporary conditions now prevalent in the lumber industry the information is presented from the standpoint of the prewar basis. The variety of information contained in this book is illustrated by the following chapter headings: Wood Pulp and Paper; Tanning Materials; Veneers; Cooperage; Cross Ties; Poles and Piling; etc. Owing to the magnitude of the subject this book is intended as a brief reference treatise preliminary to a more complete book or series of books to be published at some future date.

"NEVER AGAIN"

BY CHAS. H. SMITH

THE COLD GRAY DAWN of a November morning was just breaking as Big Bill Corrigan stepped out on the porch of the neat little white-painted cottage that he called home. For a second he paused and surveyed the leaden sky and then, setting his dinner-pail down on the floor of the porch, he pulled a blackened corn-cob pipe and a pouch from his coat pocket and, filling the pipe, he pressed the tobacco down in the bowl and lighted it. The flame from the match lighted up his rugged features with a red glow for a second and then died as a gust of wind extinguished it. Fastening his coat around his throat, he picked up his dinner-pail and started down the walk towards the car house, for Corrigan was a section foreman on the C. St. P. R. R. and was on his way to begin the day's work. He had scarcely gone a dozen steps when the door of his home was thrown open quickly and his wife came running to the edge of the porch.

"William! Oh, William!" she called, not noticing that he was only a short distance away.

"Yes, Mary. What is it?" answered Corrigan, pausing in his rapid walk.

"Oh! There you are! Don't forget to hurry home early tonight. We missed the train last Saturday, you know, and we don't want to miss it again tonight."

"All right. I'll quit on time and hurry right home so that we can go this time," answered Corrigan.

"I thought I'd better remind you," said his wife. "Good-by."

"Good-by, Mary."

As he strode along the path to the car house Bill speculated on who would win the prize to be awarded to the foreman having the best section on the subdivision. The truth was that Corrigan had hopes of winning it himself. He knew that the condition of his track was just about as good as he could make it when the inspection special had whisked over the system last October. Not only was it good in all essential features, but its appearance was excellent, and Bill knew that this was a big point, a very big point, in his favor in the eyes of the judges. Then, too, he had ridden over his section a number of times on the fast passenger trains, and although he had been severely critical he had had to admit that the track rode very smoothly. Of course there were some twenty-one other foremen on the subdivision in competition with him, but still Bill thought that he had a chance to win the prize. If he did, it meant $50 velvet.

Arriving at the car house, he unlocked the doors and entered. It was a few minutes before the regular time for starting work and his men had not yet arrived. Placing his dinner-pail in the compartment on the motor car, he busied himself oiling the bearings and filling the gasoline tank. While he was thus engaged his men came in and, greeting him, placed their dinner-pails on the car and rolled it out on the main line. After Corrigan got a line-up at the telegraph office, they started for the west.

"Carl," said Corrigan, addressing his oldest and most experienced man when the car had been placed on the set-off near the west end, "I want to visit some of my relatives over Sunday, so I won't be down tomorrow morning to run over the section with you. Will you look after things and see that everything is all right while I'm gone? I'll be back Sunday night."

"Sure I will," answered Carl Weiman, who had formerly acted as assistant foreman.

"Good!" said Corrigan. Then, turning to his men, he announced: "Carl will take my place tomorrow morning."

Picking up their tools, the men started their work of tightening bolts and tapping down spikes, moving eastward as they worked.

At three o'clock Corrigan called to his men to cease work and place the car on the track. Their day's work ended at three thirty, and it was nearly 20 minutes run from the west end to the car house. Piling their tools on the car, the men prepared to start.

"Before we go east," said Corrigan, "we'll run over to the end of the section and see that everything is all right."

The car quickly sped to the extreme west end of Corrigan's section, and while the men were turning it, Bill walked back a few rods to inspect a rail they had passed over. For some days back he had watched this particular rail. The reason was that on the top of it long black streaks had appeared and were growing broader. It was a piped rail, and Corrigan well knew what such a rail meant. A glance told him that it was rapidly becoming dangerous to leave in the main line and, getting down on his knees, he looked under the ball to see if any cracks had appeared in it. A short line of rust told him that the rail had started to crack and ought to come out at once. Corrigan looked at his watch. Only 20 minutes before quitting time, and to replace the rail would take an hour at least, for he would have to go two miles after a new rail, bring it back and then make the change. If he should do this he couldn't possibly get home before five thirty or six o'clock. With this thought he remembered that he had promised his wife that he would be home early so that they could catch the train to Wellsburg, where her sister lived. Last Saturday he had made the same promise, he recalled, and had arrived home an hour late because he had had to wait for the supply train. For a minute he stood indecisive as he considered his course of action. He did not want to disappoint his wife again, and he certainly did not want to take any chances with a defective rail in the main line. While he was pondering the question over his men pushed the motor car up behind him.

"Carl," he called to Weiman, "what do you think of this piped rail? How does it look to you? Do you think it ought to come right out, or will it last a couple of days longer?"

"Well," answered Weiman, "that's hard to say. A

piped rail is a mighty treacherous thing, in my opinion. It might last quite a long time—and again it might go all to pieces in a day." Getting down on his knees, he made an examination of the underside of the ball of the rail. "It has started to crack a little already. Still, it is not bad yet. It might last at least a couple of days longer, anyway."

"I wish we'd seen that crack sooner and we would have taken it out," said Big Bill. "But we haven't the time now unless we put in an hour or two overtime, and I want to quit on time tonight. . . . Well, we'll let it go, I guess. Watch it to-morrow when you run over the section."

And so it was that Corrigan was able to keep his promise and get home on time that evening. An hour later he and his wife caught the train for Wellsburg and started on their trip. But Corrigan was worried about the defective rail. Being a conscientious worker, he could not tolerate any lack of thoroughness. And he could not help thinking that he was taking a chance in leaving the piped rail in the main line. More than once while he was on the train he wished that he had changed it. For 20 years he had kept his record clear, and now he had risked it to take a short trip for pleasure.

Sunday night when he got home the first thing he did was to walk around to Weiman's home.

"Good evening, Carl," he said when Weiman came to the door in response to his knock. "Everything O. K. on the section this morning?"

"Good evening, Bill," returned Weiman. "Everything was right as could be."

"Did you look at that piped rail?" asked Corrigan.

"Yes—it was just the same as it was Saturday. Seemed to be standing up all right. I think that we'd better get it out soon, though."

"Tomorrow morning, first thing we do," replied Corrigan decisively.

But alas! Fate had another task in store for him. That night shortly after midnight the telephone in his dining room rang shrilly for a long minute. Groping blindly in the darkness, Corrigan stepped from his bedroom and took down the receiver.

"Hello!" he called.

"Corrigan?" came a voice over the wire which Bill recognized as that of the night operator at Westvale.

"Yes, this is Corrigan."

"Here's a message for you: 'To Foreman Corrigan: Get your men and go to wreck at west end your section and assist in repairing track and clearing wreckage.' Signed, H. H. Moyer."

For a moment Corrigan stood stunned. On the west end of his section! The piped rail! It had given away—and only a few short hours before he was going to take it out. The irony of it struck him. Why—why hadn't he taken it out Saturday, even if he had been compelled to work all night? If he only had it to do over again! He was to blame for the wreck.

"Did you get it?" asked the operator, interrupting his thoughts.

"Yes. Yes—I understand. Did—did you hear what caused it?"

"They don't know yet. It's a bad one. Track all torn up and box cars all over the right of way. It was a freight train that went in the ditch."

Bill heard his words with a sinking heart. "I'll get my men and be right over," he said, after a moment's pause.

He hurriedly dressed and left the house. Telling Weiman of the wreck, he instructed him to call part of the gang while he went after the rest of them. When he had notified all of the men he went to the car house to await their coming. His thoughts were gloomy enough. Even if the officers didn't know the cause of the wreck, he knew it. They would be sure to find the cause in time and the probabilities were that his railroad career was ended. He had taken a chance and lost. But Big Bill had no desire to "cover up." He laid the blame entirely upon himself and was willing to accept the consequences. It hurt him deeply, too, when he thought of his good record for 20 years.

Soon the men arrived, and Corrigan stepped into the telegraph office to see if any instructions had been sent to him.

"Moyer, the roadmaster, is on the phone and wants to talk with you," announced the operator.

"Corrigan," came Moyer's voice over the phone, "I want you to bring eight rails over to the wreck just at the west end of your section, and we are going to need 500 ties, too. You and your men will have to 'larry' them down there. Also bring what spikes and bolts you have and 16 or 18 angle bars."

All night long the combined gangs of the subdivision toiled to clear the wreckage and rebuild the track. Cars were all over the ground and the steam wrecker pulled and strained, lifting the heavy loads back upon the rails which were laid as the wreckage was cleared away. Load after load of ties and rails Corrigan and his men larried to the wreck.

During the night the men worked under the glare of the four big lights on the wrecker, which followed the huge hook wherever it went. Torches flickered here and there and shed their smoky light over the wreckage. Then with the coming of dawn the men snatched a quick breakfast in the dining car of the wrecking outfit and hurried back to work. For Corrigan there was one small grain of comfort and that was that no one was injured or killed. The financial loss was heavy, but human life did not enter into the toll.

Seventeen hours after the wreck occurred everything was cleaned up. All the cars that could be salvaged were rerailed and the loads in others, hopelessly damaged, had been transferred by the large force of men working on the wreck. Wreckage was burned and the track rebuilt and a slow order put out on it. Wearily Corrigan and his men picked up their tools and started for the car house. It had been a long, tiresome grind for them and they were glad that it was over.

The next day Corrigan went to work depressed by the feeling that he would hear of his dismissal any moment. He dreaded to go near the telegraph office. However, nothing happened. But the second day when he went into the telegraph office he found a message in his box. "Meet me at Westvale on arrival of No. 2," it read. It was signed by Moyer. When Bill saw this message he knew that his railroad career was undoubtedly ended. He hadn't an excuse in the world to offer. Arranging his work so that he could be at Westvale station when No. 2 pulled in, he silently awaited its coming.

Ten minutes before the train was due Corrigan walked over to the depot. With a heavy heart he watched the engine coming around the curve half a mile away. Roadmaster Moyer was on it coming to dismiss him from the service and explain why he was taking this action. Well—he didn't need to explain why, thought Bill, for he already knew.

Almost before No. 2 came to a standstill Moyer was off the train. Glancing around the crowd he saw Corrigan and in a few seconds the two met.

"Corrigan," said Moyer, "I want to congratulate you. The judges on the inspection special have awarded you the prize for having the best section. Here is the $50."

As he spoke he handed Big Bill an envelope. For a moment Bill was too surprised to speak and he could do nothing but stare at the envelope in speechless amazement.

"Well, aren't you going to take it?" asked Moyer in surprise as Corrigan made no move to take it. "You're the man who won it according to the judges and I think you deserve it too, Corrigan. If I were to award the prize myself I'd give it to you."

"But—but the wreck," said Bill, as he still hesitated to take the envelope. "Do you know what caused that?"

"The wreck? Certainly we know what caused it. A loose wheel on a hopper gon. caused it. It ran along on the ties for some rods before reaching your section and piled them up just on the west end of your section. It was a bad one, but it's almost impossible to guard against such defective equipment. Too bad to spoil such good track, though."

Again Corrigan was rendered speechless. A heavy load had been lifted from his conscience, which was a greater reward than any amount of prize money could possibly have been.

"Here! Take this quick!" said the roadmaster, as No. 2 started to pull out. "Anyone would think that you didn't give a —— about winning $50 prize money."

Thrusting the envelope into Big Bill's hand, Moyer swung himself on No. 2 and Corrigan was alone. For a moment he gazed stupidly at the envelope, and then, opening it, he removed a crisp check for $50 payable to himself. For a long time he looked at it lost in thought and then, raising his right hand above his head, he uttered two words. And these words were "Never again!"

Reports on Recent Rail Studies

THE RAIL FAILURE statistics for 1918, compiled by the Rail committee of the American Railway Engineering Association and several studies of failed rails are included in Bulletin No. 218 of that association, which is now being distributed to the members.

Rail Failure Statistics

The rail failure statistics, which have been compiled by M. H. Wickhorst, engineer of tests for the Rail committee, deal with rail failures for the year ending October 31, 1918. The tonnages reported by the statistics in the report are as follows:

Year Rolled	Bessemer	Open-Hearth	Total
1913	155,417	1,550,938	1,706,355
1914	59,918	1,060,763	1,120,681
1915	12,141	1,034,531	1,046,672
1916	42,399	1,191,628	1,234,027
1917	24,223	1,077,832	1,102,055
1918	12,967	470,768	483,735

It will be noted that rails of Bessemer steel form only a small part of the tonnage covered by the reports. The average weight of open-hearth rail reported for 1918 was 101.5 lb. per yard, while that of Bessemer rail was 87.4 lb. per yard, indicating that the open-hearth rail was placed in tracks demanding heavier service. In spite of this fact the Bessemer rail show a larger number of failures per 100 track miles, as is indicated by the following table:

Year Rolled	Years Service	Failures per 100 Track Miles Open-Hearth	Failures per 100 Track Miles Bessemer	Comparative Failures Open-Hearth	Comparative Failures Bessemer
1913	5	90.3	107.7	100	119
1914	4	47.4	111.1	100	234
1915	3	33.8	62.7	100	186
1916	2	27.9	41.6	100	149

The total number of failures per 100 track miles is decreasing steadily, the number of these failures after five years service, as shown in the reports from 1913 to 1918, inclusive, being as follows:

	Failures per 100 Track Miles 1913	1914	1915	1916	1917	1918
Bessemer	413.3	373.9	236.9	214.1	134.1	107.7
Open-Hearth	370.5	198.5	154.0	161.9	102.7	90.3
Total	398.1	277.8	198.5	176.3	107.1	91.9

Study of Transverse Fissures on Santa Fe

On December 10, 1917, a train on the Gulf Lines of the Atchison, Topeka & Santa Fe was derailed by a rail which broke into 16 pieces and showed 13 transverse fissures. This rail was of 90-lb., Santa Fe section. The 51 remaining rails of this heat were located, removed from track and sent to Topeka, Kan., where they were subjected to extensive tests to detect further indications of fissures. The drop and etching tests indicated the presence of great numbers of cracks in the interior of the head of some of the rails, a few of which acted as nuclei for the growth of fissures in service. Chemical analyses showed rail steel of about the usual composition, fairly evenly distributed, and that the rails with fissures were all about the same composition as the other rails. The physical properties of the rails were about normal in the different parts of the section, except that the rails with fissures were low in ductility in the head, both longitudinally and transversely.

Relation Between Length of Service and Transverse Fissures

W. C. Cushing, chief engineer maintenance, Pennsylvania Lines West of Pittsburgh, has prepared a monograph describing a study of rails which have given long service to determine whether these rails show any indication of transverse fissures.

The investigation was based on the assumption that if stored-up internal stresses in rails proceeding in combination from three principal components which affect them in service, namely, (1) cooling strains of fabrication, (2) cold-rolling strains from wheel loads, (3) direct stresses in the track, tell the whole story of the cause of "transverse fissures," then it might be reasonably expected that rails especially long in service would be not only likely to have that type of defect, but would be almost certain to have it, particularly if the elastic limit of the metal were very low, thus reducing the ratio between it and the wheel load. Six sets of rails were selected, as follows:

	Years
English rails (wrought iron), Louisville division	41
German rails (iron and steel pile), Long Island R. R.	45
P. R. R., Bessemer, Pittsburgh division	25
P. R. R., Bessemer, Columbus division	22
A. S. C. E., Bessemer, Pittsburgh division	10
P. R. R., Bessemer, Cincinnati division	19

Notwithstanding the high internal stresses, low elasticity and lack of homogeneity in the structure found in the rails, a close examination failed to disclose any signs of transverse fissures. Mr. Cushing concluded that "it is reasonable to expect, therefore, that if severity of service, especially by exceedingly heavy wheel loads, be the sole cause of the defect known as transverse fissure, these rails, after their unusually long service, and in some

of the cases under the heaviest wheel loads in use, would be sure to be filled with transverse fissures. That such was proved by careful examination not to be the fact, that rails adjacent to and undergoing precisely the same conditions of service as those in which transverse fissures have been found do not have any, and that rails never put into service as well as those which have been in service have been shown by Waring and Wickhorst to contain microscopical cracks, seems to prove beyond a doubt that the real cause of transverse fissures must be sought in the processes of manufacture."

INTENSITY OF PRESSURE ON RAILS

A subcommittee of the Rail committee which has been investigating the intensity of pressure due to wheel loads submitted a report based on a series of tests from which the following conclusion is taken:

The experiment seems to indicate that with this section (100-lb. P. S.) and composition of rail the load of 25,000 lb. per car wheel should not be exceeded, but your committee is not prepared to accept this as a general conclusion. The intensity of pressure which a given spot on the head of a rail will stand is evidently influenced by the resistance of the metal surrounding that spot; a larger or differently shaped head may yield to a much less extent. Some of the New York Central experiments show that where the wheel and rail contour fit, the areas of contact with a given load are much increased by this longer contact across the head. If but one wheel contour and but one rail contour existed and could be maintained, this would go far toward settling the question, but it must be remembered that with the existing diversity due to modifications of the original contour produced by service, this ideal condition is not likely to be reached. It is very certain that the practice of allowing wheel contours to depart widely from the original standard before renewal or re-turning is at the direct expense of severe punishment of any rail section that can be devised.

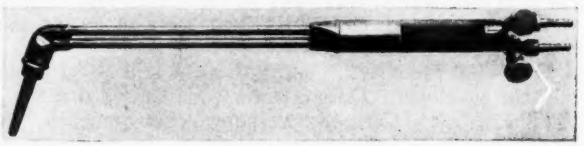
NEW AIRCO WELDING TORCH

A NEW WELDING torch, designed to meet the varied requirements of modern welding, has been introduced by the Air Reduction Sales Company, New York City.

This torch is of strong construction, while at the same time light and well balanced; it has a knurled handle so proportioned that a firm grip can be secured. The butt of the torch and the valve body form a solid casting with hose connections extending straight out from the base and so made that the valve stem handles, which are octagonal in shape, both come on the left side. The tubes between the head and the handle are of hard-drawn, seamless brass, countersunk at both ends and silver soldered. The head is drop forged from the same special alloy that is used in the tip, thus giving a uniform coefficient of expansion and contraction for both parts. The conical projection of the head in connection with an equivalent recess in the tip forms a metal-to-metal seat, the latter being held securely in place by a tip nut, a form of construction allowing accessibility to the acetylene grooves for the removal of carbon when necessary.

All passages are designed and parts assembled to insure a smooth flow of the gases which are mixed at the entrance of the discharge passage in the tip and proportioned automatically to the size of tip used. It is claimed for this design that there is no premature mixing or any mixing other than in the predetermined quantities, and also that backfire or flashback is eliminated.

The new torch, which has received the approval of the Underwriters' Laboratories, is made in four different sizes, which are said to be adaptable for all classes of welding from sheet metal to heavy castings, while different heads and a wide range of tips are provided for such requirements, special or otherwise, as may come up



The Improved Torch

in general practice. An interesting feature of the torch is a gas pressure table rolled in permanent form on the upper part of the handle.

AN OBJECT LESSON IN TIE TREATMENT

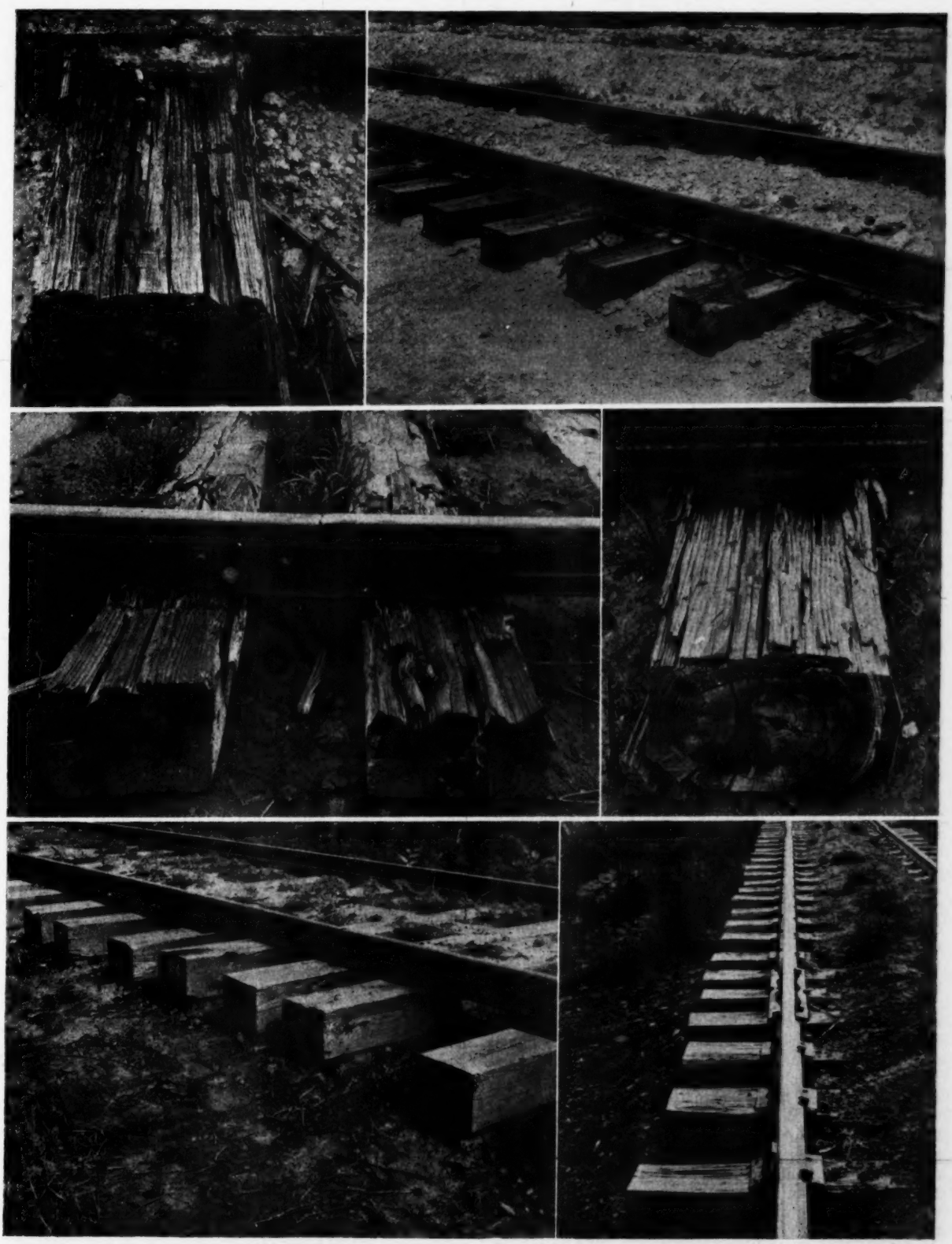
THAT THERE IS a definite return on investments in tie preservation is a well established fact, but unfortunately the necessity for careful, thorough work is not so generally appreciated. For this reason, the photographs shown on the adjoining page not only serve as an object lesson in the advantages of subjecting ties to preservative treatment before inserting them in the track, but shows also that the treatment must be carried out properly. Photographs are shown of three different installations of ties on light traffic lines of the Santa Fe in Oklahoma and Texas. One group shows untreated ties, another ties that had received inadequate or careless treatment and the third, ties that had been properly treated in the railroad's timber preserving plant.

The first group of photographs shows untreated Texas pine ties laid in a branch line of the Santa Fe built out of Shattuck, Okla. Work on this line was started in March, 1917, and after 30 miles of track had been laid, it was discontinued on September 1. The condition of the ties in the track after less than two years' service is to be seen in the photograph, which were taken in July, 1919. At least three out of every panel require renewal at once.

When work on this line was stopped in 1917 there was a surplus of about 55,000 ties on hand which were stored in piles in the Shattuck yard. These ties remained in storage at that point until January, 1919, when they were loaded on cars and moved to Albuquerque with the intention of treating them in the Santa Fe's timber preserving plant at that point. However, upon subjecting these ties to inspection it was found that 3,500 were rotted so as to make them worthless, while 7,000 to 8,000 were in such a condition that they could be treated only for secondary use.

In 1910, the Santa Fe built the line between Slaton, Tex., and Lamesa, a distance of about 54 miles, for which 157,000 creosoted Texas pine ties were purchased under circumstances that did not permit of an inspection of the treatment by the railroad's representatives. The same character of material was used in the 32 miles between Brady and Eden, on the line built west from Lometa, Tex., in the same year. However, on the portion of this same line between Lometa and Brady, 65 miles, all the ties inserted were Texas pine, creosoted at the Santa Fe treating plant at Somerville, Tex.

The condition of the creosoted ties purchased without inspection is shown in photographs taken in July, 1919. At least a third of them will have to come out of the track immediately. The condition of the ties inserted



A STRIKING EXAMPLE IN THE TREATMENT OF TIES

Top—Untreated Ties Badly Decayed in Two Years. Middle—Improperly Treated Ties Seriously Rotted in Less Than 10 Years. Bottom—Thoroughly Treated Ties in Good Condition After Nine Years.

the same year from the Somerville treating plant is shown in the other group of photographs. During an inspection of these ties made at the time the photographs were taken, it was found that not more than one-half of one per cent of them indicated any appreciable deterioration after a service of over nine years.

A Contrast in Maintenance and Its Practical Lesson

BY W. F. RENCH

AN OPPORTUNITY was recently offered for the making of a comparison of maintenance of way conditions with the class of labor handling it on the heavy traffic sections of two important branches, each a part of different railway systems. Each has about the same number of local passenger trains, 25 in each direction (week day schedule), carrying a critical class of travel into a suburban territory. On one branch there are 10 additional through passenger trains each way, which are balanced by an equal number of fast merchandise trains on the other. The speed is alike on the two roads, a maximum limit of 50 miles an hour being prescribed. With stops a mile apart, the local trains average 30 miles an hour between terminals. The grade line on one branch is undulating, while the grade of the other is on a continuous rise following the slope of a water course. The alinement includes curves as sharp as 6 deg., and carrying superelevations as high as 6 in. Both are double track lines, stone ballasted and laid with 85-lb. rail, with but two important differences between them: (1) one branch passes through a rural region, while the other traverses the heart of a steel manufacturing district, and (2) on the former, the 12 section foremen in charge of the portion of the line in question are all Americans, while on the other one half are Americans and the other half Italians.

The impression given is that these are two railroads of equivalent traffic burden but with greatly divergent advantages in maintenance, and yet they are in nearly equal condition in regard to the essential features of track repair. A casual inspection furnishes convincing proof that the season's renewals have been well covered on both roads, tie replacements have been completed as far as the material was available, while small amounts of rail were distributed here and there, giving the appearance that sufficient force was not available for making immediate renewals. The policing was also well in hand, as should be the case at this season of the year, and only in the item of line and surface was there any noticeable variation of one branch from the other, or of both from the standard of past years. While there was no great deficiency to be observed, either in riding on the trains or upon detailed examination on the ground, the conclusion was reached that there was a difference in favor of the rural line, and that neither road was being maintained to the high standard of three years ago.

The causes which have produced these divergent conditions have been largely a matter of labor inefficiency and insufficiency, along with a changing personnel among the track foremen. As will be readily understood, the branch intersecting the industrial region has the greater difficulty in retaining labor, a section under one capable American foreman has but a single laborer, who remained in service only because he is being employed in the better paying work of patrolling the track. Nearly all the laborers are Italian, and they have gravitated to the Italian foremen, who thus are able to maintain average forces of eight men. The supervisor in such a case has no alternative but to assign Italian floating gangs to work upon the sections that are short handed, or to arrange for the Italian section foremen, on occasion, to render assistance to their American neighbors. Such a practice is sure to result in a reduced output and a poorer quality of work.

In the case of the branch remote from the industrial region, the forces are more nearly uniform, both in numbers and performances, and the repairs are, for that reason, more even in result. Current repairs are wholly taken care of by the section forces, a practice which is always desirable, both from the standpoint of economy and safety, floating gangs being required only for rail renewals and track raising. The better effect upon the morale of the foreman, when he can carry through his repairs independently, is unquestioned.

Perhaps the most potent factor in the retrogression from past standards is the loss of the more experienced foreign laborers, who, during the past summer, have returned in large numbers to their mother country. A year ago there was plainly a lack of efficient labor; today there is a lack of labor of any kind, and while an attempt is now being made to offset the shortage by extending the working day to 10 hours, the opinion prevails that the change will give only a slight increase in output over the 8-hr. day. The labor question is further complicated by the increasing independence of the foreign element, for the Italian laborer is now more than ever before, disinclined to work under an American foreman. This has brought about a new problem in maintenance, and its possible solution forms the main point of this discussion.

When the Italian foreman shall have become sufficiently educated in the American language, so as to interpret clearly his instructions and understand fully the rules of operation, as they apply to his duties, the situation will improve; but there will always remain the need for the better organizing faculty of the American foreman. The result of a further encroachment by the foreign-born trackmen will probably be in the establishing of larger sections, presided over by capable general foremen, and the subsidiary units may then be placed in the hands of alien foremen.

An energetic general foreman could oversee three or four sections of ordinary length, if proper means of transportation were available, and direct in greater detail than possible with the supervisor, the work of the uneducated foremen, who can generally be depended upon to carry out with fidelity, and often with no mean ability, an operation when it has once been outlined for them. The addition of such a supervising foreman has become a necessary expedient to meet the shortage of dependable men of American nationality, and is simply the idea of the general yard foreman extended to cover section maintenance. The practicability of this plan is now being tried out in several places, and the results, so far obtained, have been entirely favorable.

RECONSTRUCTION.—Since the armistice approximately 350 miles of double-track and 300 miles of single-track line have been rebuilt in France, and only 29 railroad stations remain to be opened.

A Convention Group

BRIDGE AND BUILDING MEN MEET IN CLEVELAND

Record Breaking Attendance and Active Discussion Characterize Annual Convention Held October 21-23

THE TWENTY-NINTH annual convention of the American Railway Bridge and Building Association was held at the Statler Hotel, Cleveland, on October 21 to 23, inclusive. This was the most successful meeting in the history of the association in point of attendance as well as in interest in the reports and discussions. Over 250 members registered, this large attendance being due in considerable measure to the co-operation extended by the Railroad Administration in issuing instructions to federal managers that arrangements should be made for bridge and building supervisors and other officers interested in the maintenance of structures to attend in so far as their duties permitted.

The officers for the past year were: President, Lee Jutton, trainmaster (until recently division engineer), C. & N. W., Madison, Wis.; first vice-president, F. E. Weise, chief clerk to the chief engineer, C., M. & St. P., Chicago; second vice-president, W. F. Strouse, Baltimore, Md.; third vice-president, C. R. Knowles, superintendent of water service, I. C., Chicago; fourth vice-president, Arthur Ridgway, assistant chief engineer, D. & R. G., Denver, Colo.; secretary-treasurer, C. A. Lichty, inspector, C. & N. W., Chicago.

The meeting was called to order at 10 o'clock Tuesday morning by President Jutton and was opened with prayer by J. H. Cummin, a past president.

D. C. Moon Speaks

D. C. Moon, assistant to the federal manager of the New York Central at Cleveland, welcomed the association to that city. In his address Mr. Moon referred to his contact with bridge and building men extending over a period of 40 years. He said in part as follows:

It requires the best of judgment to meet the practical requirements of safety and permanency in bridge construction, with a reasonable allowance for both, while at the same time not going so far as to be wasteful or extravagant with the company's funds, because bridge building at best is a very costly necessity in railroad construction and maintenance, the earnings of a bridge costing $1,000 per lineal foot being no greater than for the same length of track costing $5 per foot.

My personal observations and experience led me long ago to feel that, as between the so-called practical "horse sense" and the technical or book knowledge, I would select the man with the former qualifications for a majority of the jobs. One can buy books and technical knowledge, but he cannot buy brains. The purely technical man has usually proven a costly theorist, as many an employer has found out to his sorrow. But the practical man has moved along on safe lines and been the employers' benefactor. Strive to be a combination man in every sense, and with that you surely will be a success. Study formulas and technique, for they must be used, but don't forget to keep your mind working on the practical side of every job.

President Jutton's Address

President Jutton reviewed the activities of the association during the past year and dwelt particularly upon its growth. He referred to the increase in numbers from the 60 charter members of 29 years ago to the present membership of 800. In alluding to the seven deaths among the membership during the past year he emphasized the importance of safety campaigns, particularly in view of the fact that the National Accident Prevention Campaign of the Railroad Administration was then under way. He then paid a tribute to the 30 members of the association who were in the active service of their country during the war. He closed with a reference to the handicaps now confronting bridge and building men in the handling of their routine work, owing to the greatly increased costs of material and labor and to the decreased efficiency of the men.

The report of the secretary-treasurer showed a balance on hand in the treasury of $1,325, an increase of $300 during the last year. The number of new members was 80, a larger number than in any recent year.

REPORT ON METHODS OF BRIDGE INSPECTION UNDER PRESENT CONDITIONS

There are, generally speaking, two kinds of inspection of bridges, one for the detection of defects involving immediate safety, and the other for the detection of waning serviceability. Since the first is primarily a matter of constant patrol, the second is the subject of this investigation and what is herein contained pertains exclusively to the matter of inspection as involved in current maintenance from year to year. Much of the following is based on replies to a questionnaire received from 40 roads with an aggregate mileage of 90,000.

Metal Bridges

While climatic conditions have a very material effect on the durability of metal bridges, no general statement can be made that territorial location is responsible in any way for the methods used in inspections. An annual inspection of metal structures is more generally in effect than that of any other periodicity, while the officer conducting it is more frequently chosen directly from the staff of the chief engineer than from any other group of officers. The motor car seems to be the most common means of locomotion for the inspection party, and the tools used for metal bridges consist generally of rivet hammers, calipers, rules and tape measures.

By far the greater number of railways use regular forms for taking and recording notes in the field. These forms are diversified in character, ranging from ordinary mineograph forms to bound notebooks. Some roads require notes to be taken in detail, others contemplate the record being made in narrative form. Many of the forms seem to cover the matter very comprehensively, while others are painfully lacking in provision for adequately making the requisite notes.

By far the greater number of railways make inspection separately for the various members of metal bridges and it is probable that the general appearance of the structure and the judgment of the inspector are the criteria as to whether actual measurements are necessary. In most cases recommendations as to repairs and renewals are made at the time of inspection and are recorded with the notes, but with metal bridges it is more than likely that such recommendations are appended to the inspector's report after mature consideration has been given to conditions reported at the office.

Lee Jutton,
President

Generally the inspection notes are copied before being filed and the disposition of the notes is extremely diversified. In some cases careful calculations are reported as being the method of determining changes in the carrying capacity of the structure, but in other cases no such calculations or other investigations are customary. Almost all carriers report the practice of comparing records of previous inspections with conditions found, in an effort to determine the progress of deterioration.

Authority to Order Repairs

On almost all roads the inspector has authority to order repairs or replacements, but this authority is usually exercised only with wooden bridges, since the repair, reinforcement or replacement of metal structures is ordinarily the result of a definite program of elimination or reinforcement and therefore cannot, on account of its being a matter of policy, be delegated to the inspector. At least with respect to metal bridges the practice of making recommendations to some other officer is more general than any other method. A few roads report the maintenance of an established system of determining by prescribed limitations in stress as to what action should be taken on the inspector's recommendations. This cannot, however, be said to be the general rule. Before definite action is taken on the inspection reports their consideration is strictly a matter for the bridge engineers with whom the reports are finally lodged. Few, if any, special forms are used on the majority of the roads in reporting to superior officers the results of the inspection as embodied in the field notes.

Wooden Bridges

Entirely different results are to be expected from the effects of climate on wooden bridges than with metal structures, but no definite statement can be formulated as to the general effect of climatic conditions in the periodic inspection of wooden bridges for railroads in the same territory differ as to the frequency of inspection. A tabulation of returns shows the periodicity of inspection and the percentage of total mileage reporting under that periodicity as follows:

Annually	41.55 per cent
Semi-annually	32.22 " "
Three times annually	5.95 " "
Four times annually	2.62 " "
Six times annually	13.11 " "
Monthly	4.55 " "

Nearly 75 per cent of the mileage represented in the replies to the committee's letter of inquiry customarily use the motor car as a means of conveying the inspection party over the line, while only about 21 per cent use regular or special trains. The tools generally used for the inspection of wooden bridges consist of a special inspection bar and testing auger, although in some cases a chisel and brace and bit are added to the tool equipment.

Regular forms for recording inspection notes in the field are used by 85 per cent of the mileage represented in the returns to the questionnaire. Actual measurements are reported as being taken by 52 per cent of the reporting mileage, while general appearance and judgment are used by the remainder. By far the larger portion of the lines record in the notes recommendations as to repairs and renewals at the time the notes are taken. While 85 per cent of the reporting mileage use regular forms for the reports, there is no uniformity in the manner of handling the notes when completed or the final disposition thereof.

General practice is about evenly divided as to giving authority to the inspector to order repairs or replacement in distinction from simply making recommendations as to these matters. The officer most often made responsible for bridge inspection is either the supervisor or the superintendent of bridges and buildings.

C. A. Lichty,
Secretary

Conclusions

1. A well organized plan of thorough and periodical bridge inspection should be in effect on all railroads. Inspection should preferably be made semi-annually and in any event not more infrequently than annually.

2. The inspector should be particularly fitted by training and experience for the work, technical training being requisite for metal bridges and both judgment and experience for wooden structures.

3. Motor cars afford the best means of conveying the inspection party over the line.

4. Such tools, either special or standard, as he may consider useful for his purpose should be furnished the inspector.

5. Special inspection forms for taking and recording notes are essential. Adequate provision should be made for reporting the conditions of bridge members individually or by groups and classes, dependent upon the facts disclosed by the examinations.

6. Sufficient assistance to insure thorough and comprehensive examination of a structure should be supplied.

7. Where necessary to determine the extent of deterioration, actual measurements of members should be made.

8. Recommendations of the inspector as to corrective

measures which should be applied to observed conditions are not only desirable, but practically necessary. These recommendations should be recorded in the notes at the time of inspection and upon its completion should be followed up through proper channels for necessary action thereon.

9. The inspector should be vested with authority to order through proper channels the correction of any imminently unsafe condition discovered.

10. Prescribed limitations in stress should, if possible, be established, especially for metal bridges.

11. The general program of inspection can best be formulated by the individual railroad and must needs be developed by a consideration of the operating organization in vogue, methods of effecting repairs and renewals and the number, magnitude and character of bridges maintained.

12. At least one complete counterpart of all notes, recommendations, records and papers pertaining to the inspection and corrective measures applied as a result thereof should be kept in one file of ready access.

F. E. Weise,
First Vice-President

W. F. Strouse
Second Vice-President

C. R. Knowles
Third Vice-President

Arthur Ridgway
Fourth Vice-President

Arthur Ridgway, D. & R. G. (chairman); J. H. Johnson, G. T.; Herbert Keith, consulting engineer; G. W. Rear, S. P.; J. L. Winter, S. A. L., and J. S. Huntoon, M. C.

DISCUSSION

G. W. Rear (S. P.) advocated the division of the subject assigned to the committee between structures of truss and stringer construction instead of those of metal and wood. He stated that there are over 100 wooden truss bridges on the lines under his supervision and that his practice is to inspect these structures particularly for safe loading and for the state of preservation of the timber. R. H. Reid (N. Y. C.) defended the action of the committee in dividing the subject between metal and wooden structures because of the difference in the character of their deterioration. He pointed out that timber begins to decay from the date of its installation, while metal bridges can be maintained indefinitely. He also pointed out that metal structures require a different form of inspection than timber.

The discussion relative to the frequency of inspections revealed a wide difference of opinion. M. Johnson (I. C.) thought a semi-annual inspection unnecessary, inasmuch as the working season is limited to six months, and one inspection necessarily determines the amount of work to be done in that season. C. W. Wright (L. I.) advocated an inspection every two or three months.

The character of tools to be furnished the inspector also brought out discussion. R. H. Reid stated that inspectors on the New York Central are provided with a ⅜-in. steel bar pointed at one end to enable them to determine sap-rotten timber and with a round knob on the other end for use as a sounder to determine interior decay in piles and large timber. They also used a ⅜-in. auger to bore into timber to detect dry-rot, particularly in Howe truss members. For the inspection of steel bridges they use a steel bar to break off heavy rust and sometimes use the head of the bar to detect loose rivets, although these usually show red rust quickly.

Interest was also shown in the form of making inspection notes. G. W. Rear advocated the narrative form of report as affording an opportunity for the inspector to give expression to his ideas regarding the conditions found. He described the practice in effect on that road for the inspection of over 715,000 lin. ft. of wooden structures, whereby inspectors are employed throughout the year on this work, going over the Southern lines in the winter and the Northern lines in the summer, inspecting every structure on the road as they pass over it and making a report on each. These inspectors are accompanied by the division engineer, the division bridge inspector and the division bridge supervisor. Recommendations for the repair or renewal of the structures are determined on the ground, these recommendations being subject to review in the general office to bring them within the limits of available appropriations. This inspection party has authority to start emergency repairs at once when considered necessary. Copies of the recommendations of the inspection party are forwarded to the division superintendent, who prepares requests for work authorities, which are transmitted to the general manager for approval. The employment of general inspectors tends toward uniformity in standards of maintenance of these structures over the system. A record book is maintained for each division and is revised annually, the bridge supervisor and inspection party having copies of these books and making notes therein. G. W. Andrews (B. & O.) described the practice in vogue on that road whereby each division is provided with one or more bridge inspectors who are equipped with books of simple forms made in triplicate, one copy of which is sent to the local bridge supervisor and another to the division engineer.

The question of the extent to which one can estimate the strength of old wooden structures brought out differ-

ences of opinion within the committee as well as on the floor of the convention. H. C. Keith, a member of the committee, took exception, in a minority report, to the statement of the committee that "it is scarcely possible to determine with any degree of satisfaction by calculation a change in carrying capacity due to deterioration or decay of timber" and to other similar statements implying inability to determine accurately the limitation of stress in old timber. G. W. Rear, another member of the committee, defended the action of the committee and opposed close figuring of stresses in wooden bridges, as his experience has shown in most every case where a timber bridge has been taken down that the timber has been in worse shape than was expected.

Lee Jutton (C. & N. W.) emphasized the fact that judgment also enters into the inspection of metal structures, for many details must be settled by other than mathematical computation. Mr. Reid pointed out that the strength of a member is not necessarily determined by that of the open section but that it may be determined by the strength of connections or other points.

REPORT ON THE INSPECTION AND REPAIR OF ROOFS

A roof should receive as close if not more careful inspection than any other part of a building. The better and more permanent classes of roofs do not require as frequent inspection as those of the cheaper classes, but the inspection should be none the less rigid. It should include everything on the roof, including skylights, ventilators, flashings, gutters, eaves troughs, downspouts, etc.

A supervisor must be careful to determine the economical limit of repairs in order to obtain the maximum life from a roof, and in so doing he must exercise due caution lest leaks occur in buildings where valuable goods are stored, resulting in serious damages. Some railroad buildings may be carried along indefinitely, awaiting changes or new developments and in such cases a supervisor may be called upon to determine how best to carry the roofs with the least amount of expense until such time as the final disposition of the buildings may be determined.

A supervisor should always make a thorough inspection of the masonry and fire walls adjoining the roof, because the joints in the coping and brick work become so washed out within a few years that water percolates down inside the wall, resulting in a report of a leak in the roof for which the roof proper is in no way responsible. The remedy is to remove the coping, repair and point up mortar joints in brick, lay in a damp-proofing course of prepared roofing, and replace the coping, pointing it up with a plastic bituminous cement. Sometimes a layer of the plastic cement is used instead of the prepared roofing. It is useless to attempt to waterproof the faces of the walls by moppings of various waterproofing compounds unless the walls are tight on top.

Flashings are a common source of leaks; those which are supposed to be permanently cemented to the brick work are rarely found thus after a few years of exposure to the elements. Large cut nails and flashing hooks should be used freely to hold the upper edges of flashings in place. The mortar used in pointing is often too soft; a rich cement mortar or bituminous cement should be employed in the repair work, applying it along the upper edge of the flashing.

In localities where melting ice during the day and frozen leaders during the night are a common experience, gutter heads are an active cause of leaks, which are rarely cured entirely. The flat metal portion of the gutter head should always be nailed down securely over the full thickness of the roofing and wall joinings; then the flat metal should be covered with solid moppings of felt and pitch, carried back at least 18 in. from the opening. If the metal is not closed in on both sides, the expanding ice in the downspout or leader will surely break the roofing away from it while it is cold and brittle. Straight runs of gutter which are improperly applied underneath roofing of various sorts frequently cause trouble of the same kind. The best remedy for leader troubles is the use of inside drains with heads like the Holt roof connection, clamped securely in place without the use of nails.

Roof coverings that depend on paint or other coatings

A Group of Past Presidents

to prolong their life are apt to become neglected, creating a liability of damage or premature loss. Especially is this so in the case of railroad buildings where frequent changes are made among officers and workmen.

Wooden shingle roofs usually have to be repaired with wooden or tin shingles. When such roofs become old they are a fire menace, especially when they are in close proximity to coal-burning locomotives. On account of the poor quality of wire nails many shingle roofs have to be renailed within a few years after being laid. There is no doubt but that if wooden shingles are dipped in a fire-resisting preparation before being laid, and are recoated at intervals of several years, they can be made immune from the ordinary fire risks from without. As a general rule the ordinary oil paint applied to shingles after being laid is a detriment.

Tin roofs require soldering or patching when in need of repairs. Temporary repairs may be made by the use of tested elastic bituminous compounds, while leaks of a minor nature can be checked for a time by the application of a heavy coat of paint. Tin roofs should be painted with a good mineral paint about every four years.

There are many brands of composition roofings, commonly termed prepared roofings, which are laid in sheets or from rolls. Some of these will last from 10 to 15 years, while some of the cheaper grades depend on an occasional coating of some special preparation in paint form to prolong their life. Such roofs can be patched successfully, this being about the only manner in which repairs can be made. The seams and joints have to be watched and may require a little cement or renailing occasionally, as this is where leaks are liable to appear first, especially if the laps were not properly secured when the roofing was applied originally. Roofs of this character must receive proper attention, for if a preparation of any kind is necessary to prolong their life it must be applied at the right time.

The last few years have seen the introduction of the asphalt shingle. It is simply a prepared roofing of medium weight with mineral facing. When laid on suitable inclines to shed water it rarely leaks because there are always two and sometimes three thicknesses of roofing material. Sometimes shingles curl at the lower corners. It is difficult to replace them, so the usual treatment in

such cases is to nail the corners down with 1-in. fine wire nails.

There are all sorts of gravel roofs, many of which have been bought too cheaply. A three-ply roof made of light felt, put together with 60 lb. of pitch and tar, and covered with possibly 100 lb. of gravel, will need repairs inside of three years. A five-ply roof made of 70 lb. of felt and 100 lb. of pitch, properly graveled in, will last seven years. The addition of 25 lb. of pitch at the time the roof is built will make it last from 10 to 15 years. A roof containing about 80 lb. of felt and 150 to 250 lb. of pitch, depending upon whether the roof deck is of wood or concrete (as recommended in the Barrett specification), will surely outlast its 20-year guarantee, and probably be good for 35 or 40 years.

Good gravel roofs are made of coal-tar pitch which has a melting point of about 145 deg. F. Roofs all over the country are subject to a temperature of from 130 deg. F. to 150 deg. F. every summer. Under such temperatures these coal-tar pitch roofs automatically heal any small checks that may have developed in the surface during the intense cold of the previous winter. One function of the gravel is to protect the pitch against the blazing heat of the sun. If any bare spots develop in a gravel roof because of the use of inferior pitch, the sub-

Some of the Officers

stitution of tar for pitch, or failure to apply enough gravel in the first place, such spots should be covered with more pitch, and an ample amount of gravel embedded in it while hot. Many roof failures can thus be forestalled.

Standard gravel roofs or makeshift gravel roofs (described in the preceding paragraph) can profitably be recoated at any time before the felt becomes exposed and begins to turn brown. The method is to sweep up all roof gravel with a stiff brush, pour on an ample amount of coal-tar pitch, and then resurface with clean gravel. It is safe to use the old gravel if it is screened, but a considerable amount of new material must be added to the old in order to secure a good job.

If the roof has been neglected until leaks develop, it is necessary to go over it carefully after it is swept up and in all places where cracks or serious rotting of the felt is found, such places should be covered with at least three thicknesses of felt and pitch, leaving margins in successive layers of the repair of at least four inches all around before the recoating is done. Most roof troubles develop in angles where the roofs join walls, scuttles, skylights, etc. Two or three layers of solidly-mopped pitch and felt in such places never do any harm, and assist in making a good job.

About the only way to repair clay tile roofs is to replace the broken tile with new material of the same kind. When such roofs are constructed originally a number of the tile should be laid aside for repairs, especially if the material is of an odd design and not readily obtained in the market. The repair of tile roofs requires skilled labor.

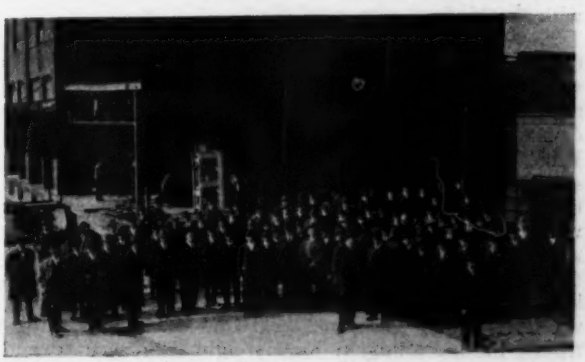
Large pre-cast cement tile are coming into use, being applied to steel frames for inclined roofs. Few roof foundations are rigid. This permits some movement in the nature of torsion. For this reason leaks develop in the seams at right angles to the ridge, and the use of flexible bituminous cements is becoming general for these seams. Such cement is readily applied with a pointing trowel or putty knife, but transverse fractures caused by freezing water are rarely cured by this treatment. Such tiles must be replaced with new ones.

Slate roofs are usually repaired by substituting new slate, and this can be done readily because standard sizes are always available. A good slate roof having greater than half pitch will last many years without repairs. Slate is not adapted for roofs having less than one-half or one-third pitch, especially in northern climates, as the water from driving storms and melting snows gets under the shingles and, if freezing occurs under such conditions, they become broken in great numbers. Where such conditions exist some roads cover the laps and seams with one or the other of the various elastic gums or bituminous cements containing asbestos fibre and weather-proofing oils which are coming into extensive use. This prevents further breakage and makes the roof tight. The cost of such repairs is $4 to $5 per 100 sq. ft., and should prolong the life of old slate roofs from 8 to 10 years. Elastic gums of this nature should be a permanent part of the equipment carried by every repair crew.

E. J. Barry, D. L. & W. (chairman); Geo. E. Boyd, D. L. & W.; H. F. Jonas, S. P.; K. Peabody, N. Y. C.; A. B. Nies, M. C., and P. J. O'Neill, N. Y. C.

DISCUSSION

The use of plastic cement for the repair of metal roofs brought out considerable discussion. J. H. Markley (T. P. & W.) described the use of plastic cement on tin roofs and gutters to overcome leaks successfully. He stated that he has also used it on gravel roofs. G. W. Andrews (B. & O.) described his experience with the use



At the N. Y. C. Freight Terminal

of these cements on metal roofs, in which he has found that they prevent leaks for 18 months to 2 years, but at the end of that time he has found that the metal has been destroyed. He also related his experience with slate roofs on which he has found that the slate itself is permanent, and that the nails with which it is fastened are not, and that broken slate and leakage result from this weakness. As a result of these experiences he advocated the use of high-grade, built-up gravel or asphalt

roofings on slopes of moderate pitch, but even with this form of construction one must be prepared to pay the price necessary to get the proper materials. He referred to structures on which prepared roofings of this character have lasted 17 years without any attention, and to others which have required renewal in 7 years.

C. J. Scribner (C., B. & Q.) described the use of plastic cement on roofs of various types. He also referred to its use in the repair of a water tank where a layer of cement, a sheet of muslin and another layer of cement stopped 90 per cent of the leakage and delayed the renewal of the tank for two years.

E. K. Barrett (F. E. C.) described the use of cement in the repair of galvanized iron roofs, referring to one structure which was so repaired 10 years ago and which lasted for 7 years, when it was again treated in the same way and is still in good shape. He also described the repair of a concrete roof on a very flat slope with three coats of asphalt.

REPORT ON METHODS AND EQUIPMENT USED IN RENEWING TIMBER BRIDGES IN WHOLE AND IN PART

Railroad timber bridges are as old as railroading. The art of building them has been well developed for many years and, as their construction is quite simple, new features are not frequently brought out. As timber has become harder to obtain, traffic heavier, and the country drained, more permanent types of bridges have been constructed, or the openings filled and abandoned. On many roads an untreated timber bridge is now built only as an emergency structure. Improvements in methods in recent years have been confined largely to tools. These are mentioned elsewhere. As a consequence of these conditions this report is largely a résumé of present practice.

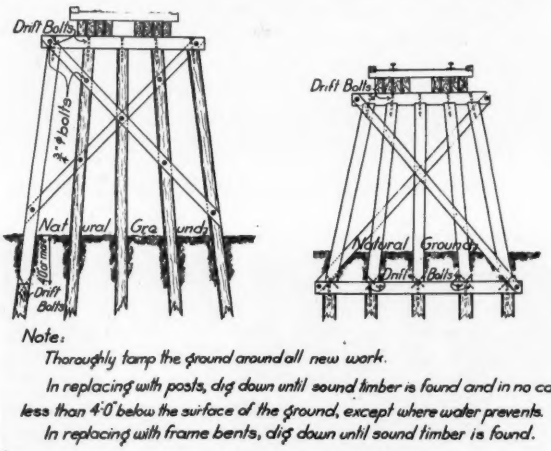
REPAIRING TIMBER BRIDGES

In general, gangs for timber bridge work consist of a foreman, an assistant foreman and six or eight men, as follows: two first-class carpenters, two assistant carpenters and two to four laborers. Variations from the above are made as the work demands or in accordance with the kind of men available.

The distribution of material depends on the quantity to be handled and traffic conditions. Where material is ordered from the mill, cars may be consigned to the station nearest the bridge site for unloading or redistribution by one of the methods mentioned below. When shipped from the storehouse, the use of company service cars may be found convenient. These can be held under load and shipped from point to point as the work progresses. For unloading use may be made of a special work train or, where the quantity of material does not justify this expense, recourse may be had to a local freight train. When two or more cars are to be unloaded it may sometimes be found economical to distribute the unloading by local freight train over several days. Small quantities are handled by motor trailer or push car.

There does not seem to be uniformity of practice in the use of second-hand material in any given part of the bridge. It would appear to be the best policy to use second-hand material only for blocking and helpers on important lines, but it might be used somewhat more generally on light traffic lines in bridges, the life of which will not be greater than the life of the material.

Where one-third or less of the piles in a bent are in bad shape satisfactory repairs can usually be made by cutting off in solid material at or below the ground line, and setting in a post on this foundation. Such a post will have a better appearance if it is of the same shape as adjacent piles. It should be spliced to the foundation pile with four three-inch scabs bolted through, drifted through the cap at the top and well bolted to the bracing. It should have an identifying mark as a helper. Posts are sometimes put in on blocking between piles. A weak pile may thus be relieved of some of its load and at the same time the benefit of its stiffness be retained. A repair of this kind is an obstruction, if placed in a stream, and is unsightly in any situation. In cases of settlement, or where piles are decayed far below the ground line, it may be necessary to drive a new pile alongside the old one and spring it under the cap. When entire bents are to be removed, in most cases the pile may be cut off at sound timber below the ground



Upper Portion of a Pile Bent May Be Replaced by a Frame Bent

line and a frame bent erected on this solid foundation. The bent should be framed without a cap, set up and made ready to slip in as soon as the piles are cut off. When conditions require it an entire new bent may be driven alongside the old bent, the new piles sawed off, the old piles cut out and the new bent pulled into place. Some roads restrict the height at which frame bents shall be used in this manner to 10 feet. In renewing caps it is first necessary to pull the stringer drift bolts to clear the cap. Then jack up the deck one or two inches (jacks may be supported on the ground or on sash timbers bolted to the piles for the purpose), raise the old cap to give room to cut off the drift bolts with a hack saw. When this is done, roll off the cap. The new cap having previously been framed and a hand line attached about its center, let it down over the side of the deck and swing it into place. Drift it to the piles, lower the deck and redrive the stringer drift bolts. When a scaffold is necessary for this work it may be hung from the ties with staging hooks carried regularly in the outfit for this purpose. An old cap may also be removed readily by cutting it into three or four pieces and splitting it out. This gives easy access to the drift bolts in the tops of the piles.

The renewal of an outside stringer is quite simple, as it is only necessary to withdraw the bolts, jack up the rail and ties about two inches, turn down the stringer to be removed, shove it out on the caps, drop the new stringer previously framed on the caps and raise it up and bolt it. To renew the middle stringer in a chord the method is similar, but with broken joints it is necessary to remove the bolts extending over four panels.

After raising the track, the two outside stringers are laid down, the weak center stringer removed, the new one placed and the balance of the chord reassembled. When it is necessary to renew an inside stringer it may be done in single panel lengths from the inside as described above, the new stringer being handled with lines through the deck. In renewing an inside stringer extending over two panels, it is necessary to take up the guard rail and shift the ties, either along the track or to one side. It is then possible to drop the new stringer vertically into place. This method may also be followed with center stringers. Some prefer to raise the track a little more than the width of the stringer, roll the old stringer over to its side and raise and work it over the chord and on to the caps. The new stringer is placed by reversing this operation.

A method of strengthening the chord involving much less labor consists in adding an additional stringer on either side of the existing chord. It is not, however, good practice to leave partly decayed timber in a bridge because of the fire risk.

In renewing isolated ties, remove the adjacent deck bolts and pick up the track about six inches. Place a 4-in. by 4-in. stick about 10 ft. long across the stringers on each side of the tie. These may be held in place by wedging under the rail or other means and should project on the side toward which the tie is to be moved. Rollers are slipped under the tie and it is rolled out until it clears the rail, when it can be lifted up on to the track and disposed of. Where a number of ties are to be renewed, put in all the new ties in one place and spot in the good second-hand ties where needed. In such cases it is usually necessary to take up the guard timbers where the new ties are put in. Another method is to raise one rail higher than the other, slip the ties out to clear the low rail and then back and over the low rail.

It is usual to lay guard timbers in position and mark the location of the ties. The daps are then cut in them, either on the bridge or the bank, and the timber placed in final position. It is the practice of one road reporting to this committee, where more than 50 ft. of guard timber is to be replaced, to measure the tie spacing on the bridge and dap the timbers in the shop.

RENEWING BRIDGE TIMBERS

The year's program for timber bridge work having been determined, it is usual to do all the driving in advance and let the pile driver crew return later to place the timber, or have this work handled by other crews. A minimum of pile driver and work train service is thus secured. After locating the bents to the best advantage relative to the waterway and clear of existing bents, and marking their location on the rail, the guard timbers are taken up, the ties are shifted to clear the new bents and driving is started. It is usual to work backward on a bridge. The work will proceed more rapidly if piles are distributed on the ground in advance. After driving the piles, the ties are re-spaced as well as is possible and guard timbers are relaid, cutting out the spacers where necessary.

When the bridge crew arrives at a bridge where the piles have been driven as above, the first step is to straighten and line up the piles. This may be done with jacks and steamboat ratchets and the piles should be held in position. If badly out of line, this work should be done with the pile driver before it is moved from the job. After marking the grade, usually obtainable from the track, and attaching a guide board the piles are cut off. The stringers and deck are then raised about two inches on the old caps to permit the placing of new caps. The cap is brought in, swung off the deck on to the top of the piles and drifted in place. Sway bracing is next put on and bolted up. With high bents, say over 20 ft., some longitudinal bracing should be put on as the stringers are placed.

As soon as two or more caps are in place measurements for the length of the stringers are obtained and the framing of stringers can be started. This should be done on a level stretch of ground as near the bridge as possible and consists in cutting to length, sizing to depth over the caps, and boring for drift bolts where they are used. Holes may also be bored through one line of stringers in each chord for packing bolts.

Methods of assembling stringers into chords are varied. In most cases one chord is changed out completely before the other one is disturbed.*

In renewing a bridge, when the old ties are in bad shape about one-half the new ties are put in between the old ones before placing the stringers. This gives a more substantial deck to work from. The remainder of the new ties are put on after the stringers are changed. Ordinarily ties are put in between the old ties or in groups as traffic permits, after the new stringers are in. Some roads defer this work until all the heavy timber released is picked up to avoid scarring up the new deck.

Every bridge gang should have a sufficient supply of the ordinary tools of good quality. Where special tools have been tried out and proven advantageous, gangs should be supplied with them. There can be no argument about the desirability of labor-saving devices at the present time, not only as a means for reducing the amount of labor but for keeping the men employed better satisfied. Among such agencies first place should be given to the motor car and its trailer for handling small amounts of material. Ball-bearing jacks, patent bushed blocks and thin-backed saws are some of the devices that lighten labor and shorten the time for doing the work.

Maro Johnson, I. C. (chairman); E. K. Barrett, F. E. C.; E. R. Clothier, C. M. & St. P.; F. N. Graham, D. M. & N.; A. J. James, A. T. & S. F., and J. P. Wood, P. M.

DISCUSSION

The discussion of this report hinged largely on the advisability of renewing ties on bridges singly or out of face. E. K. Barrett (F. E. C.) advocated inserting a number of new ties together, particularly on structures where tie plates are not applied, as it is difficult to secure equal support for the rail where a new tie is inserted between two which are rail cut. To overcome this objection one member described the practice on his road of framing each tie to the proper height in the shop before shipment to the bridge in order that it might be installed between adjacent rail-cut ties. J. L. Pickles (D. W. & P.) turns rail-cut ties over to overcome this difficulty. Some of the members who advocated the renewal of ties out of face stated that it was their practice to reinstall at other points such ties as were fit for further service, but F. C. Baluss (D. M. & N.) opposed this practice because of the present high cost of labor.

OIL VERSUS STEAM ENGINES

A paper was presented on Internal Combustion Versus Steam Engines for Pumping Water by C. A. Lichty, which was similar to a paper which he presented before the convention of the International Railway Fuel Association in Chicago in May and which was abstructed in the *Railway Maintenance Engineer* for July, page 248.

*The report presented two methods of changing out stringers supplied by E. M. Grime, supervisor of bridges and buildings, Northern Pacific, which was given in substance in an article by Mr. Grime, appearing in the *Railway Maintenance Engineer* for January, 1918, page 11.

In the discussion of this paper a wide difference of opinion developed regarding the relative merits of steam and internal combustion engines for pumping plants. E. A. Demars (O. S. L.) favored steam plants because they require less experienced operators. He stated that he has found trouble in securing men sufficiently trained and experienced to operate and maintain gasoline engines. J. P. Wood (P. M.) stated that he has found gasoline engines to be more economical than steam for small stations. He employs section foremen to run engines at a number of minor points on that road and has found that they are able to do this work satisfactorily. In larger stations where stand pipes are installed he favored steam plants, largely because of his practice of piping exhaust steam to the stand pipe pits to prevent their freezing in extreme cold weather.

C. R. Knowles (I. C.) presented data showing the comparative costs of operating a gasoline station pumping 200,000 to 300,000 gal. of water per day which was operated originally by steam and recently changed over to an oil engine which showed a reduction in fuel cost of over $1,000 per year under identical conditions. G. W. Andrews (B. & O.) stated that there are a number of points on his road where gasoline plants are not practicable, as they are flooded at certain seasons of the year. He referred to one line of 100 miles on which there are five water stations which have been under water five times this year. He uses steam plants at these places in order that the stations can be operated even when under water. In general he favored the use of gasoline engines for ordinary locations. C. R. Knowles (I. C.) and others pointed out the fact that oil-burning engines can be operated on lines subject to floods by placing the pumps in waterproof pits and locating the engines above the high water level, this arrangement giving much higher efficiency than operating steam pumps under water.

L. A. Cowsert (C. N. O. & T. P.) is installing oil engines whenever making a change in pumping station equipment. He stated that he is able to effect a large saving at many stations removed from main tracks by piping oil in gravity lines to the pumping plant instead of hauling coal by wagon.

J. L. Pickles (D. W. & P.) described his experience with the installation of kerosene carburetors on gasoline engines in which he has found it necessary to rebore the cylinders within three or four months, as a result of which he is now considering returning to the use of gasoline carburetors.

REPORT ON PAINTING METAL RAILWAY STRUCTURES

Naturally the first operation in the painting of a structure, and one which should receive a great deal of attention, is cleaning. The greatest enemy of steel is rust and to make a job of painting successful the rust must be removed. The seventeen roads which replied to a questionnaire of the committee all specify scrapers, wire brushes, chisels, and bars for this purpose, and three use the sand blast occasionally. There can be no doubt that the sand blast is by far the most thorough method of cleaning, but the cost is excessive and it is not generally used on that account. Some of the roads specify sledges and bars for the removal of rust, but it would seem that a structure that is so rusty as to require such heroic treatment has been seriously weakened and indicates faulty methods of inspection.

All are agreed that the first coat of paint should be applied as soon as possible after cleaning, providing the steel is dry as paint will not adhere to a wet surface. The use of sprayers is not advised; 16 of the roads reporting unfavorably, while one officer stated that he believed it to be as good as brushing, but remarked that he has had no experience. The operation of brushing is of vital importance and should receive more attention than it usually does. In painting steel only enough paint should be used to cover and that should be thoroughly brushed, mixing it with whatever rust or other impurities may have been left on the surface and working it into all crevices. The thorough brushing of paint on steel is essential, as rust begins to form as soon as the metal is exposed to the air and the brushing will tend to mix and incorporate whatever rust has formed with the paint. The best results are obtained by the use of brushes that have been worn considerably, as the temptation to lay the paint on too thick and then smooth it out is very great when using a new long-bristle brush. Some are inclined to advocate the use of the round brush, but the shape of the brush does not make much difference if the bristles are not too soft and long and sizes are used which will enable the painter to reach all the interstices as well as the broad surfaces.

The question of the material to use for the different coats was answered by 13 of the roads in favor of red lead in some form for the primer. While there are a number of inhibitive pigments on the market, none enjoys the popularity of red lead for this purpose. One correspondent favors the addition of white lead in the proportion of one-third white to two-thirds red; another advocates the addition of one per cent of lamp black with the idea of filling voids in the coarser red lead and tending to make the paint denser and more impervious to moisture. A proprietary paint is used by four of our correspondents. For the succeeding coats the preference is about equally divided between lamp black and graphite, while two report the use of brown mineral with satisfactory results.

The method which seems to be giving the greatest satisfaction and to be followed most universally is to prime with red lead, with the second coat a mixture of red lead and lamp black and finish with lamp black or graphite. The object of mixing red and black so as to make a brown for the second coat is that, as it is a different color than either of the other coats, it is easier to see when the work is covered; and the addition of the finer pigment to the coarser makes a better paint on account of its greater density. Only one of the roads reports the use of any other oil than linseed; in this case soya bean oil received favorable mention. The addition of about six per cent of turpentine is recommended in nearly all cases to assist in penetration and to give the paint better spreading qualities. This is not to be considered a substitute for linseed oil, but is added to the paint for a specific purpose.

Climatic conditions have a great influence on the durability of paint; the temperature does not seem to have much effect, as we have reports from the high, cold mountains of Montana and the low, hot valleys of Arizona in which the life of similar paints is identical; although the temperature differs from 50 to 60 deg. most of the time. The shortest life of paint is reported from the coast regions where the atmosphere is damp and warm and impregnated with salt, where in some cases painting must be done every year. The longest life of paint is reported from Montana and Texas, in which territories 15 to 18 years elapse before it is necessary to repaint.

The materials used on water tanks and coaling stations do not differ materially from that used on bridges, except that in a few instances the inside surface of water tanks has been painted with hot tar. The replies to the question whether water tanks need painting oftener than other structures are equally divided, seven declaring that they

do and seven that they do not. Some extra precautions are necessary to prevent rust at the footings on account of the spilling of water from engines; in most cases an extra coat of paint is applied. Where a pocket is formed by the plates at the bottom of the pillars, filling the pocket with cement concrete is an excellent method of preservation.

No satisfactory results have been reported from the use of special coatings on coaling stations, ordinary bridge paint giving as much protection against the fumes of engines as any special preparation that has been tried. No preparation to be used as a paint can give adequate protection to overhead members subject to the direct blast from locomotive smokestacks; all such members are better protected by a cement covering or a suspended slab of asbestos or other indestructible material.

The question of painting galvanized iron brought out a great many formulas for washes to be applied to the iron before it is painted, which are supposed to prevent the paint from peeling, but none of them have any very enthusiastic advocates. The most successful method seems to be the weathering of the iron until the zinc coating is removed. If it is necessary to remove this coating from the iron before it is can be painted successfully, the zinc may as well be saved and plain iron used instead. The following chemicals are quoted as being used on galvanized iron for the above purposes: sal soda, sal ammoniac, hydrochloric acid, copper chloride, aqua ammonia, copper sulphate, nitric acid, benzine and turpentine.

C. T. Musgrave, O. S. L. (chairman); Chas. Ettinger, I. C.; E. S. Airmet, O. S. L.; Fred Gaunt, O. S. L.; B. D. Rich, S. P.; and J. R. Shean, P. E.

APPENDIX A—PROTECTION OF METAL STRUCTURES

BY J. R. SHEAN
Pacific Electric, Los Angeles, Cal.

As a rule, when steel is new, the rust is only light yellow spots here and there, and can be removed with scrapers made from old files turned over at the end and retempered and sharpened. Stiff scrapers and putty knives are also useful at this time. Steel brushes are not of much real value, except to clean dirt and loose mill scale off. Any heavy seed rust which has formed cups down in the steel should be chipped out with a hammer, and the greatest care should be taken to be sure and get all the rust out of this cup so that the clear steel shows in the bottom. Care should also be taken to avoid cutting the steel unnecessarily with the sharp edges of the hammer. The sand blast is a very thorough way of cleaning steel at this time, but it should be followed at once with the first coat of paint, as the surface starts to rust again very soon after the blast is used.

After the surface has been thoroughly cleaned, the next question is what to use for a first coat of paint to give it the maximum protection against the rust getting another foothold. There are several "inhibitive" pigments, most of which are impractical for general use. The one which is generally accepted by engineers as being the most valuable is red lead. This pigment has had many enemies among engineers and painters on account of its tendency to sag and run on vertical surfaces, and to settle into a hard concrete-like mass in the bottom of the container. These faults are caused by an excessive amount of litharge, which sometimes amounts to 30 per cent of the cheaper grades. In the last few years some lead manufacturers, by finer grinding and reroasting, have reduced the litharge until the United States Government standard is true red lead 94 per cent and litharge 6 per cent. More improvement has been made, however, and now it is possible to buy red lead containing only 2 per cent of litharge and 98 per cent true red lead Pb_3O_4. This makes an ideal paint for a first coat. Being extremely fine, it fills all pores, and brushes out in a smooth, even film, free from voids. It stays in place on vertical surfaces and does not act ropy under the brush.

Another great advantage in using this high grade material is that it can be bought in paste form, saving the time it used to take to mix up the dry red lead by hand. The vehicle with which the red lead is mixed is fully as important as the pigment itself. The merit of linseed oil is too well known to need comparing with any other for this work, although the paint film is much better if reinforced with Japan oil. Elaborate tests, made recently, have proven that, without reinforcing, an oil film loses from 18 per cent to 23 per cent of its volume in 200 days. This shrinkage of the oil film, which should hold the pigment together, is worthy of serious consideration and Japan oil or anything else which will truly reinforce it, should certainly be used. Japan oil also furnishes sufficient dryers of the right kind, as rosin dryers are a detriment rather than a help to red lead.

The amount of red lead to be used in one gallon of vehicle is a question upon which engineers differ. On the Hell Gate bridge, 37 lb. of red lead was used to 1 gal. of vehicle, but this would only be possible with the very finest quality of red lead. The general average for railroad use is about 25 lb. to the gallon of vehicle, or about 17 lb. to the gallon of paint mixed and ready for use.

When steel work is to be red leaded at the fabricating plant, care should be taken to have the specification worded in such a way that no misconstruing of its intention will be possible. In any case, the inspector should make it a point to see that the intention of the specification writer is carried out.

The coats of paint to succeed the red lead and to repaint the structure when necessary form a proposition upon which there is considerable difference of opinion. Some authorities insist that a carbon base is the best, others insist that graphite is, while others prefer mineral red or lamp black. Whatever the individual merits of these pigments are, and they probably are all good if applied right, the fact remains that they are all heat attractors. As heat is a first class destroyer, it is hard to understand why it has become such a common practice to use these dark colors. Unless the price of material is the main consideration there is no reason why steel work should not be painted in light colors, as their resistance to heat rays would certainly be easier on the oil film which holds the pigment together, than the dark colors which attract and hold the heat rays.

Canary yellow, pearl gray or light olive green will change an unsightly black structure to one that will at least be more in harmony with its surroundings. These light colors will last enough longer than the dark colors to pay for whatever difference there is in the cost of the two. It may be argued that light colors become unsightly in a short time from dirt and smoke. This cannot be noticed to any extent except overhead on through truss bridges and on overhead bridges, but even if painted black the smoke marks show considerably on this part of a bridge.

The theory to follow when applying the coats which follow the red lead, as well as any other time the bridge is painted, is to have the last coat of paint more elastic than the coat preceding it. This will insure against checking and alligatoring. Some authorities advise putting a little non-drying oil in the last coat, to make a better "shedder" of water. This would appear to be a good plan, provided it finally did dry hard by the time the

bridge had to be repainted, so that the next coat was more elastic, thus avoiding the danger of checking.

A brushed-on coat is very much superior to one applied with a spraying machine on steel work, as the protection of steel depends largely on whether or not the paint is thoroughly brushed into the pores and then laid off in a smooth, even film. A spraying machine cannot do this, and while it is a timesaver when applying varnish or a flat color and water colors which flow out of their own accord, oil color has to be brushed to give the best results on steel. Some advocate spraying and then brushing. This does not solve the problem, as the brushing in this case generally consists in drawing the brush over the surface once and smoothing it out. If work is sprayed and then brushed as much as it should be, the only saving is doing away with the necessity of dipping the brush in the paint pot. The practice of painting a bridge with a four-inch brush and perhaps one sash tool is a very poor one. Different kinds of brushes should be furnished and the workmen should be required to use them, to get the paint in every nook and corner and between angle braces, etc. It is in these inaccessible places that rust does the worst damage if once allowed to get a foothold.

The tools needed for cleaning the work before repainting are about the same as for new work. Light chipping hammers are indispensable for getting the rust scale off. For cleaning the dirt off, a small bunch of broomcorn wrapped with twine makes a very handy tool. After the dirt has been loosened with the broomcorn, it can be brushed off easily with the duster. This saves considerable scraping with the putty knife.

If a structure is properly treated when it is new, there is hardly any need of using a sand blast for repainting. The rust will only show where it is able to push the paint off and these spots should be chipped out until the cup formed by the rust shows the clear steel. Holding the blast on one of these spots until the cup is clear of rust will cause considerable unnecessary cutting of the steel around it. After the rust is cleaned off the bare places should be spotted with good red lead and then painted the same as the rest of the bridge. If this work is done thoroughly there is no reason to expect further trouble from these places, but if it is not, it is only a matter of a short time until the rust will be at its work of destruction again.

On overhead structures, where the hot cinders from the smokestacks strike with considerable force, no paint can be expected to give the needed protection without some sort of a fender for them to strike against. After the painting is done something should be devised for this purpose and placed over the tracks to take the full force of the sparks. A great deal of harm is also done around bridge seats by the dirt and cinders which are generally allowed to gather on the abutments, for when this mass gets wet an acid is formed, which not only ruins the paint film, but also induces rust action. On every road someone should be responsible for keeping the abutments clean, at least to the point of not letting the dirt accumulate until the bridge end is buried.

Steel water tanks should receive the same general treatment as other steel work. The additional cost of an extra coat of red lead on the inside of the tank is money well spent. A good quality of linseed oil reinforced with Japan oil should be used in the finishing coats on tanks, as water has a tendency to soften the oil film, and, as everyone knows, there is always more or less water splashing around. Pockets without outlets should be filled with concrete wherever it is practical to do so, especially at the footings.

Substitute oils are becoming very common now and some will do fairly well if reinforced, but the fact that at the best they are only substitutes should be borne in mind when using them, especially on tanks or near the coast, where there is considerable dampness in the air.

The painting of new galvanized iron is a very unsatisfactory problem, as the paint is almost certain to peel off in time. This may be caused by the hard, polished surface of the galvanizing not giving the paint a foothold. The same conditions are met in painting smooth aluminum. There is more or less impression among painters that the peeling is caused by acid on the surface, but this theory is discounted by the fact that a wash made of one ounce each of copper nitrate, copper chloride and sal ammoniac crystals, dissolved in soft water and then one ounce of muriatic acid added will change the surface so that paint will adhere very well. This wash turns the galvanizing a dark slate color and probably removes a good share of the zinc coating, allowing the paint to get a hold on the iron itself. The wash should be applied with a soft brush or a swab, and when it has dried the fine powder which is left on the surface should be brushed off.

Having in mind all the trouble and uncertainty regarding paint or galvanized iron, the question arises in one's mind, why paint it at all? If for certain reasons a building has to be painted why not use straight corrugated iron and paint it for protection. The cost of galvanizing iron in a first-class manner is from three cents to five cents per pound, and the iron can be painted for less than that. If a galvanized iron building has to be painted when new, and it is impractical to apply the wash, a priming coat of good red lead with considerable turpentine in it will give fairly good results. Roughing the surface by rubbing lightly with coarse sand paper will help the paint to hold. The best system to follow is to let a structure covered with this material stand without paint until the galvanizing is about worn off by the weather, and then paint it before rust has a chance to form. There is no reason why it should rust if given a fair coat of paint, as the iron is perfectly clear of rust or dirt before it is possible to galvanize it.

DISCUSSION

The painting of galvanized iron gave rise to active discussion. J. Markley (T. P. & W.) stated that he coated the surface to be painted with vinegar and then washed this off, after which he has been able to apply paint successfully. C. Ettinger (I. C.) stated that the best wash for galvanized iron which he has found is secured by dissolving six ounces of copper acetate in a gallon of water, applying this to the surface to be painted and then washing it off. He did not favor this, however, because of its cost. He emphasized the difficulty of getting employees to use the tools provided in order to secure the best results.

I. W. Swaney of the Sherwin-Williams Company presented a discussion of this report of which the following is an abstract. He prefaced this with a plea for the standardization of paints and paint specifications, stating that such standardization would cut the cost of manufacture from 25 to 50 cents per gallon. A "paint" is a liquid consisting of a vehicle with a pigment in suspension. A few pigments have been discovered or are known to us which take the place of the expensive Bower-Barff treatment. When in contact with the clean iron surface and in the presence of moisture these pigments produce a continuous insoluble, inert coating on the iron. Such pigments in the order of their utility are: Chromates of zinc and of lead; red lead and orange mineral; and black oxide of manganese.

Commercial red lead usually consists of about 85 per

cent true red lead and 15 per cent litharge. If we remove the litharge chemically we may obtain a true red lead, but a paint made up from this pigment and raw linseed oil will not dry properly, and a drier or siccative must be added to attain a practical rate of drying. Litharge, on the other hand, combines or saponifies fairly rapidly with raw linseed oil. When exposed to the air and to contact with sulphurous gases red lead has a tendency to disintegrate rapidly. It has been found that superior inhibitive results joined with greater durability are obtained when a mixture of metal chromes, pure iron oxide pigment and powdered silica is used in the paint for the priming coat. Another point which has some influence on the durability of a paint film and on its non-permeability is the fineness of the particles.

REPORT ON THE ECONOMICAL USE AND STORAGE OF FUEL AT RAILWAY PUMPING STATIONS

Steam, water and other wastes must be prevented. Pump houses should be built with a view to warmth. To minimize heat losses, boilers, steam pipes and the steam ends of pumps should be insulated where the saving will justify the expense.

Stopping Fuel Wastes

Beginning at the grates upon which the fuel bed rests, see that the air spaces are properly proportioned to avoid the loss of combustible material into the ash pit. This will depend on the kind of coal used. Study the fuel with this point in mind. Five per cent is not an unusual loss from this cause.

The amount of grate surface is important, as it determines the rate of combustion. Ratios of grate area to boiler heating surface will vary from 1:35 to 1:60, depending on the characteristics of the coal and whether it is hand fired or stoker fired. For power purposes in hand-fired plants do not permit the rate of combustion to fall below 15 lb. of coal per square foot of grate surface, per hour, or go above 28 lb. with bituminous coal.

With settings tight to prevent the infiltration of air, heating surfaces clean, radiation losses reduced by proper covering, piping and steam mains lagged, engine valves tight and properly set, and all condensation returned to the feed-water heater a good start will have been made in fuel conservation.

However, merely placing the plant in good physical condition will not suffice. Conditions change from day to day, from hour to hour, even from moment to moment. These changes must be interpreted, and the degree of intelligence with which they are interpreted marks the degree of success which will be realized in fuel saving. A good plant poorly operated will show low efficiency, while a poor plant skillfully operated will sometimes show a relatively high efficiency. Therefore,

$$\text{Ultimate efficiency} = E \times H$$

Where E = Equipment
and H = Human element.

Find out what the boilers are doing. Provide facilities for weighing the coal, measuring the feed water, checking up on combustion, determining draft, and taking temperature readings at important points. In small and moderate sized plants, hand fired, a boiler efficiency of 60 to 70 can be expected. In any given plant determine what efficiency should be expected, considering load and equipment, and keep the plant up to mark set.

The chief losses in boiler-plant operation are:

Cause.	Remedy.
1. Dirty boiler—loss up to 25 per cent.....	Clean boiler
2. Leaky setting—loss up to 15 per cent.....	Tight setting
3. Poor firing—loss up to 40 per cent.....	Good firing

1. A boiler may be dirty on the inside or outside or both. Dirt on the inside is due to scale formation and can be corrected by cleaning the boiler and then giving consideration to the character of the feed water and its proper treatment. Outside cleaning must receive careful attention. A slight accumulation of soot deposited in a few hours' run will result in a growing loss of efficiency. Someone must be delegated to follow up this matter of soot and see that the cleaning is done thoroughly, frequently and regularly.

2. Air leaks reduce efficiency. The ordinary brickwork setting develops cracks and crevices which allow a considerable amount of air to enter the setting, lowering the temperature of the gases of combustion. The porous character of the brick itself is such that an appreciable leakage takes place through the walls. The remedy is to point up the brickwork with plastic fireproof mixture and paint or cover the setting with a coat of air-tight material.

3. Bad firing includes allowing holes to develop in the fuel bed, carrying an uneven fire or too thin or too thick a fire, stirring the fire, thus forming clinkers, and improper manipulation of the dampers. It is here that the human equation becomes of most importance. Attention concentrated on what takes place from day to day in front of the boilers will pay greater returns for the time spent than in any other part of the plant.

The Storage and Handling of Bituminous Coal

It is important, in order to prevent spontaneous ignition, that the following rules be complied with as far as practicable: The storage ground should not be of a marshy nature or be subject to drainage from any source. Coal should not be stored near external sources of heat, even though the heat transmitted be moderate, and should be located away from and not stored against buildings.

Avoid admission of air to the interior of a pile through interstices around foreign objects such as timbers or irregular brickwork or through porous bottoms, such as coarse cinders. Do not permit pieces of wood, oily waste or other easily combustible material to be mixed with coal during storage, as they may form a starting point for fire.

The height of piles should be limited to 12 ft. Arrange piles in as many units as possible, restricting the length and width as far as possible, in order to provide spacing, not only for ventilation purposes, but to expedite rehandling if necessary, and limit the amount of coal in one pile subject to loss. There should be a distance of at least 5 ft. between piles, and this space maintained free for complete ventilation and dispersion of occluded gases. Pile so that lump and fine coal are distributed as evenly as possible; not, as is often done, allowing lumps to roll down from the peak and form air passages at the bottom of the pile. Where coal is stowed under shelter or inside of a structure, most perfect surface ventilation should be secured to facilitate the escape of gas by the circulation of the atmosphere.

In coal with a tendency toward heating temperature raises are comparatively gradual, and if detected in time complete combustion may be prevented by rehandling. If the ignition point is reached, a fire may burn for a considerable time in the interior of a pile before becoming apparent. For the detection and prevention of fire, iron pipes staggered every 50 ft. through piles may be used, driven within 1 ft. or so of the bottom, these pipes to be pointed and closed at the bottom to facilitate installation and provided with a stopper for closing the opening at the top, to prevent the admission of air; daily thermometer readings, or readings every few days should be taken in order that any excessive rise in temperature may be detected readily, and when the temperature has reached 125 deg. rehandling should be started. High

sulphur coal should be watched especially, owing to the danger of "heating."

Wherever it is possible to do so, all wet coal, and especially that wetted by snow and ice, should be disposed of for immediate use without first being stowed; if, however, its stowage is unavoidable, it should form the top of the pile and be spread out as thinly as may be practicable to expedite drying by evaporation.

The only effectual way of extinguishing a fire in storage coal is by rehandling. Water is not generally applied successfully in extinguishing a fire in a coal pile, because it is impossible to saturate the pile thoroughly; the best method of handling coal in danger of fire is to load it out and saturate it so that it will be thoroughly cooled off. The best preventive of loss in coal in coal storage is constant inspection for incipient heating and immediate removal of coal from the spot affected.

OIL STORAGE

Unlike coal, oil, if stored in closed tanks, does not deteriorate when standing nor is it subject to spontaneous combustion; but the greatest care should be given to its storage, as oil and its vapors are very searching and extreme precautions are advisable, although with proper ventilation of the tanks, the danger from fire is nil.

Weight for weight, oil can be stored in a smaller space than coal. One ton, or 2,000 lb., of bituminous steaming coal occupies approximately 40 cu. ft., whereas a ton of oil occupies approximately 35 cu. ft. The relative storage value of coal as compared with oil is therefore 10 to 11.5.

Steel tanks for the storage of oil may be secured in all sizes and in accordance with any particular specification, but it is more economical and satisfactory to have sizes and specifications conform to the gage and sizes of sheets commonly carried in stock by the manufacturers, as specifying tanks of special size causes waste through cutting sheets rolled to standard sizes and increases the cost of storage.

Burying oil tanks partly or wholly in the ground is a common practice. However, the ultimate economy is questionable, as the depreciation of the shell from soil corrosion may be rapid, and leaks, unless relatively large, are hard to detect and expensive to repair.

The El Paso & Southwestern has been storing fuel oil of 24 deg. to 38 deg. B, in circular concrete tanks about 12 ft. in diameter by 6 ft. deep, at various places along its system for the past five years. The bottoms of these tanks are 8 in. thick and the sides 6 in. thick, each tank being covered by a concrete roof. Tanks that have been in use five years have been examined inside and out without any signs of leakage being discovered. At present the company has 12 such tanks, and their adaptability to oil storage has proved so satisfactory that more are in process of construction. No oil or waterproofing compounds are used.

Oil losses by seepage from properly constructed steel and concrete tanks can be considered practically negligible. The volume of useful hydrocarbon products that are lost through evaporation in oil storage is a considerable item, however. This loss, of course, is greater in the lighter oils than in the heavy oils, although there is a continued stream of the light hydrocarbons escaping from its surface so long as it remains in storage, even with oil of low gravity.

There are two general rules to follow to prevent evaporation losses: (1) Keep the temperature of the oil in the tank as low as possible, and (2) make containers as tight as practicable. The color of paint used on storage tanks is an important factor in preventing evaporation. It is reported that tests have demonstrated that evaporation from tanks painted white averages about 1 to 1½ per cent less than from tanks painted red, and about 2½ per cent less than from tanks painted black.

F. M. Case, C. & N. W. (chairman); C. R. Knowles, I. C.; E. A. Demars, O. S. L., and A. D. McCallum, C. H. & D.

DISCUSSION

L. A. Cowsert (C. N. O. & T. P.) stated that he erects a stack not less than 30 ft. high for all boilers at pumping stations because they are more economical in fuel consumption. A. W. Harlow (Erie) stated that the supervisors of locomotive operation on that road watch the firing of pump locomotive boilers in common with other fuel consumers in the campaign for fuel conservation, and that it is the practice on that road to require the operators of pumping stations to fire a shovelful of coal at a time. Fuel sufficient for the winter's supply is unloaded at each station by work trains in the fall and that required in the summer is unloaded a car at a time.

E. A. Demars (O. S. L.) and others pointed out the losses from the storage of too much coal and from its deterioration in piles. Mr. Demars also emphasized the importance of giving attention to the condition of grates, stating that from 25 per cent to 50 per cent of the coal may go through broken grates unburned.

One member stated that he has found by test that the keeping clean of flues in old locomotive boilers effected a saving of 17 per cent in coal consumption where soft coal was used. C. R. Knowles (I. C.) opposed the use of this type of boilers for water station use because of their inefficiency in fuel consumption. Mr. Knowles further stated that feed water heaters are coming into use at many stations, particularly on the eastern roads, as an aid in fuel conservation.

RAILWAY FIRE PROTECTION EQUIPMENT

BY C. R. KNOWLES
Superintendent Water Service, Illinois Central

The subject of fire-extinguishing apparatus is necessarily one of great detail and brings out the study of the extent and character of the properties, the natural conditions surrounding them, and their use and occupancy. The class of appliances will necessarily cover a wide range, starting, however, with the idea of having an ample supply of water to meet the maximum conditions that may arise. Careful study is necessary to determine the specific character of the fire-extinguishing devices required to meet the demands of each class of property. These include the use of water mains and fire-hydrant systems under ample volume and pressure from public or private reservoir or other source of supply, with incidental fire pumps, elevated tanks, standpipes, fire hose, fire extinguishers, steam jets, sand pails, water barrels and pails; all of which must be studied and installed with due regard to their relative values. An important fire-fighting agency on railroad properties is the locomotive or yard engine used at terminals and large yards remote from public protection, so equipped for supplying water under pressure with the aid of fire hose as to give good service in the event of fires in rolling equipment and its lading.

The five principal fire-extinguishing agents in use on railroads are as follows: Bicarbonate of soda, caustic soda and sulphuric acid, carbon-tetrachloride, dry sand and water.

Where definite recommendations are made they are in accord with the requirements of the National Board of Fire Underwriters and instructions given in Bulletin No. 8, "Manual on Fire Protection for Railroad Proper-

ties," issued by the Director General of Railroads in 1919. Acknowledgment is given to this bulletin for much of the material contained in this paper.

BICARBONATE OF SODA—This is nothing more than common baking soda and is usually contained in tin tubes; it is useful only in incipient fires and is of but little value as a fire extinguisher. The use of dry powder extinguishers of this type should be discontinued, as too much reliance may be placed upon them.

CAUSTIC SODA AND SULPHURIC ACID—Chemical fire extinguishers using soda and acid are usually furnished in the 2½-gal. hand type and in the 40-gal. type mounted on wheels. The hand type is one of the best fire extinguishers known for small incipient fires. As many of them are located at points where there is no other fire protection, it is important that they be kept in perfect order at all times. They should be discharged, cleaned and recharged at least once each year, the date of recharging to be marked on the tag attached to the extinguisher. At least two extra charges should be on hand for each extinguisher.

The care of extinguishers should be assigned to some particular man at each point, as a division of responsibility for their condition will lead to neglect. They should be inspected weekly; this inspection should include a careful examination of the nozzle, hose and hose connection and the renewal of defective parts as soon as discovered.

Extinguishers of this type should not be exposed to freezing temperature, if it is possible to avoid it, and should be accessible at all times. Hand extinguishers should be hung in accessible places, with their tops not more than six feet from the floor. Only those approved by the National Board of Fire Underwriters should be used.

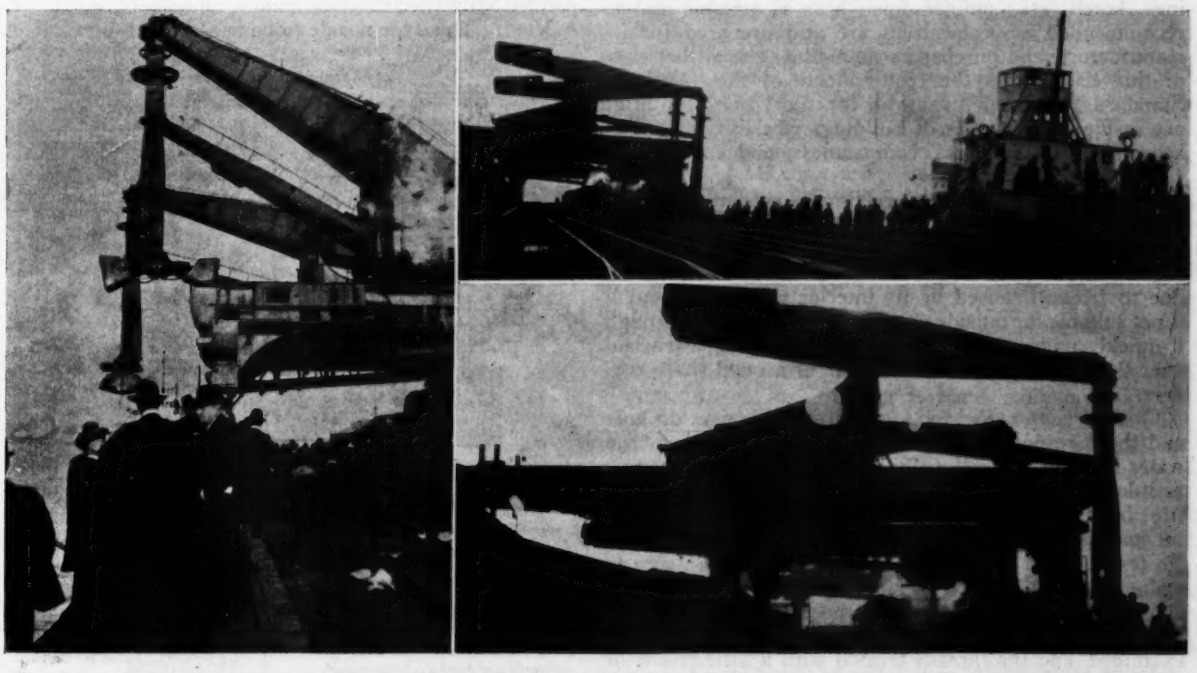
CARBON-TETRACHLORIDE—This liquid is particularly effective on fires in hazardous liquids, other rapidly burning materials, electrical fires and other fires not readily extinguished by water. The extinguisher for using this liquid is usually of the one-quart pump type and, on account of the small size, is of value only in incipient and small fires. The freezing point of carbon-tetrachloride is 25 to 50 deg. below zero, therefore it is very desirable where low temperatures prevail.

SAND—Sand is useful chiefly in oil fires and should be contained in pails or properly constructed sand boxes with scoops for throwing. The sand should be clean and dry and the supply should be located near a doorway in order that it may be accessible. The boxes or pails containing the sand should preferably be above the floor to keep the sand free from dirt and moisture.

WATER—Water is, of course, the principal agent used in fighting fire, all other agents being of value chiefly on incipient fires, or in chemical, oil and electrical fires which are usually limited in extent. Therefore, from whatever source water is obtained for fire purposes, the supply should be ample and constant. Second only to an ample supply of water is the importance of adequate facilities, properly constructed and so located as to permit fighting the fire with a minimum of delay.

Calcium chloride is possibly superior to salt in the following respects: it does not corrode steel tanks and barrel hoops readily; it has no odor and will remain odorless even if left standing for a long time, and its affinity for moisture prevents evaporation of the water. Where calcium chloride solution is used, wooden barrels should first be well coated inside with asphaltum, or with a mixture of crude paraffin and resin, to prevent shrinking of staves and consequent leakage.

FIRE HOSE—Fire hose is one of the most important of fire-extinguishing agencies, and, as with all fire-extinguishing apparatus, to be reliable it should be of the best material and workmanship. By purchasing only the best hose and giving it the small amount of attention suggested, the greatest practicable economy will be assured. Experience has shown that a good cotton rubber-lined hose, properly cared for, will frequently last 10 or 15 years.



Convention Party Inspecting Ore Docks at Cleveland

Cotton Rubber-Lined Hose—For use on the yard hydrants of shops, mills, terminals or other property and for the interior of large stations, warehouses, piers, shops, etc., a single "jacketed" or "ply" cotton rubber-lined hose is suitable for ordinary pressures and is recommended. For many yards and buildings it is preferable to the thicker and heavier jacketed hose, as it is easier to handle, more quickly dried and more economical. For yards or buildings where hose will receive rough handling or be liable to heavier wear and pressures, the same quality of hose is recommended with additional jackets, separate or interwoven, composed of the same kind of cotton fabric.

For use on yard hydrants, no hose smaller in inside diameter than 2½ in. should be used. The loss of pressure is three times as great in 2-in. hose as in 2½-in. hose, and, although where a line of only 50 ft. is used the effect of friction is not much, for longer lines it is a serious detriment.

Unlined Linen Hose—For fire hose to hang up in exceptionally dry, warm rooms, corridors or office buildings, hotels, etc., unlined linen hose is suitable and is recommended. Specifications are also prepared for its manufacture, and purchasers should be assured that hose of this class meets the requirements of the "National Standard." Its chief value is for short lines for brief use inside some classes of buildings where it is best on account of its lightness, compactness, and convenience for use by one man alone.

Linen hose is injured every time it becomes wet, but if kept in a dry place it may continue a reliable safeguard for 20 years or more. It is not suitable for lines of more than 50 or 100 ft. in length because of the loss of pressure due to friction caused by its interior roughness; and it is not suitable for outside use, because holes chafe through it quickly under the pulsations of a pump or when laid over sharp stones, cinders, material, or around sharp corners.

Care of Cotton Rubber-Lined Hose—Owners of hose and those responsible for its care are urged (1) to run water through it occasionally (at least four times a year), as it keeps the rubber in good condition and lengthens its life; but to drain the hose and allow the cotton fabric to become thoroughly dry before stowing away again. (2) To test it about once a year to about 500-lb. pressure to make sure it is in good condition. If put on a cart and allowed to remain after use, wet hose is liable to become damaged quickly. The couplers and washers should be examined, and the threads treated with a little tallow or mineral oil. The wet hose should be hung up in a tower or laid on racks to dry. If the hose is dirty, it should be brushed off with a broom after drying. (3) Keep the hose valves tight so that hose will not be wet by leakage. Where cotton rubber-lined hose is attached to standpipes on the interior of large stations, warehouses, piers, shops, etc., in order to prevent leakage entering the hose at hose connections, place a ¼-in. drip cock in the body of valve or a fitting with drip cock as near the valve as possible, leaving it open to drain away leakage. (4) Avoid keeping hose in warm rooms, but preferably in a small, well-ventilated hose house. (5) Roll up or stretch out all stock hose, as far as possible, to prevent sharp bends or kinks in it which may injure both fabric and lining.

Care of Unlined Linen Hose—Never wet unlined linen hose except to use at a fire.

Keep the hose valves tight so that it will not be wet by leakage. This is the most common cause of injury to hose of this kind. Use a well-made brass-bodied gate valve.

To prevent leakage entering the hose at hose connections, place a ¼-in. drip cock in body of valve or a fitting with drip cock as near valve as possible, leaving it open to drain away leakage.

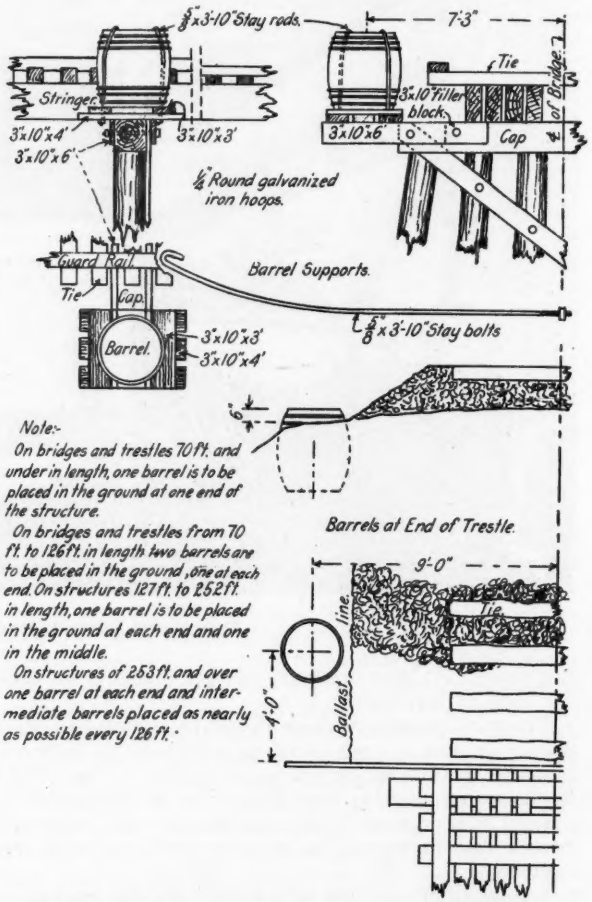
Stretch the hose out from time to time, that it may be dried between the layers. Racks for linen hose should allow it to hang vertically, as this gives better ventilation than if folds are laid horizontally.

The necessity for uniformity in the size and screw threads of hose couplings throughout the country has often been strongly emphasized, as is the case when one neighborhood is likely to call upon another, in the event of a serious fire. Where couplings are not uniform, adapters should be provided.

Rigid and systematic inspection of all fire apparatus should be made by specially-delegated employees, preferably members of fire brigades, at least once a week; everything down to the smallest piece of apparatus should be in its place and in good order ready for use, and a report of such inspection should be made to those in authority.

FIRE HOSE NOZZLES—Underwriters' Play Pipe 2½ in. by 30 in. long. Orifice 1⅛ in., screw nozzle wound and painted with metal swivel handle, smooth bore.

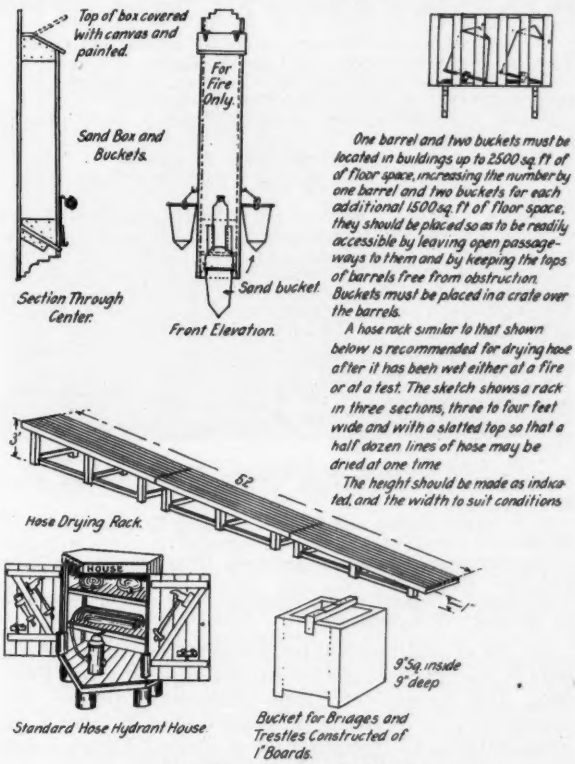
Note: This type nozzle to be used on 2½-in. C. R. L. hose outside of buildings. Two underwriters' play pipes to be on each hose cart. C. I. play pipe with brass hose threads, aluminum bronzed, 2½ in. by 12 in. long, to be used on 2½-in. C. R. L. hose in buildings. C. I. nozzle with brass hose threads, aluminum bronzed, 1½ in. by 12 in. long, to be used on 1½-in. C. R. L. hose or unlined linen hose.



Method of Placing Water Barrels on or Near Bridges

FIRE PUMPS—Unfortunately there are but few pumps

used exclusively for fire protection on railroads, the average pump being designed and used primarily for general service pressure. Fire protection being incidental, therefore, it is impractical to apply the fire underwriters' regulations to all pumps without impairing the service for which they are primarily designed. It is sufficient to say that where service pumps are also used for fire protection their operation should conform as closely as possible to the rules laid down for fire pumps. All connections between service and fire lines should be equipped



Fire-Fighting Equipment

with proper valves, plainly marked, and their use fully understood by all concerned.

PIPE LINES—Pipe lines serving fire hydrants and fire connections should be independent of general service where possible, but if a part of the general service system they should be so constructed and arranged that service connections can be cut off and full fire pressure maintained on hydrants and hose connections. Underground lines should be of cast iron, laid in complete circuits or gridironed when practical to do so, and should be not less than six inches in diameter, except where extensions are being made to existing lines of smaller diameter. They should be laid to a sufficient depth to prevent freezing and should not be run under buildings.

VALVES—Post indicator valves should be used to control all underground fire mains wherever possible, if post indicator stands are not practical for any reason. Valves should be located in valve pits and their location and purpose plainly indicated by signs. Where fire mains are connected direct to general service lines a check valve should be placed so that it will close automatically when fire pressure is applied or a post indicator valve installed and its purpose fully understood.

HYDRANTS—Fire hydrants should be of an accepted type offering the lowest resistance to the flow of water. Ground or outside hydrants should be of the two-way type and should be designed to drain automatically when the valve is closed, to prevent freezing. It is very desirable that the outlets be fitted with independent hose valves. All outlets from ground hydrants should be 2½-in. openings. Threads on hydrant connections should fit the connections on public fire department hose. Hydrants should be located far enough from buildings to prevent them being inaccessible during a fire, or from being put out of service from falling walls; 50 to 75 ft. is usually the proper distance. They should be painted white so they may be located readily at night. They should be inspected frequently to see that they are in proper condition and that they drain properly to prevent freezing. Under no circumstances should fire hydrants be used for other than fire purposes. Hydrant wrenches and spanner wrenches for tightening hose should be located conveniently and in sufficient number to provide at least one for each hydrant.

WATER BARRELS AND BUCKETS—The number recommended is as follows:

In passenger stations, three pails for buildings of ordinary size, increasing the number by one pail for about each 500 sq. ft. of floor space over the first 2,000 sq. ft.

In freight stations at least one barrel and two pails for buildings of ordinary size; increasing the number in larger buildings by one barrel and two pails for each additional 3,000 sq. ft. of floor space over the first 3,000 sq. ft., so as to make them readily accessible to all parts.

In combined passenger and freight stations, one barrel and two fire pails to be placed in the freight room, increasing the number in larger buildings as indicated for freight stations.

In shop buildings, one barrel and two pails to be distributed for about each 3,000 sq. ft. of floor space.

In warehouses, two pails for a floor space of 1,000 sq. ft. or less, increasing the number by one pail for each additional 500 sq. ft.

In other and miscellaneous property as conditions may require and permit.

Barrels to have a capacity of not less than 50 gal.

FREEZING—When fire barrels and pails are located where there is a liability of the water being frozen in cold weather, it is recommended that chloride of calcium or salt be placed in each to retard freezing. The density of the solution required will depend upon existing temperatures.

DISCUSSION

C. W. Wright (L. I.) urged that every employee using any form of fire protection equipment be required to make a report to the proper officer immediately to insure this equipment being kept in readiness for use at all times. He opposed the installation of sprinkler systems on piers and in other places of wooden construction because of the difficulty of maintaining them.

G. W. Rear (S. P.) stated that he has found that the placing of water barrels on the end of caps on high bridges inadvisable, as it has been his experience that none other than a bridge man will take the risk of going out on the caps to secure water to put out small fires. For this reason the Southern Pacific has built platforms at the level of the track on which the barrels are placed. These platforms also serve as refuge platforms.

CLOSING BUSINESS

The committee on subjects suggested the following topics for consideration by committees during the next year: (1) Filling Bridges With Special Reference to the Maintenance of the Structures During Filling; (2) Standard Forms for Bridge Inspection; (3) The Abuse of Treated Timbers; (4) The Repair and Maintenance of Tank Hoops; (5) The Maintenance and Repair of Freight House Floors; (6) The Use of Electricity for Pumping Water; (7) The Application of Paint for Spraying; (8) The Maintenance of Timber Docks;

(9) The Reclamation of Bridge, Building and Water Service Materials.

The following officers were selected to serve for the ensuing year: President, F. E. Weise, chief clerk to chief engineer, C., M. & St. P., Chicago; first vice-president, W. F. Strouse, Baltimore, Md.; second vice-president, C. R. Knowles, superintendent of water service, I. C., Chicago; third vice-president, Arthur Ridgway, assistant chief engineer, D. & R. G., Denver, Colo.; fourth vice-president, J. S. Robinson, division engineer, C. & N. W., Chicago; secretary-treasurer, C. A. Lichty, inspector, purchasing department, C. & N. W., Chicago; members of executive committee, J. P. Wood, supervisor bridges and buildings, P. M., Saginaw, Mich.; A. B. McVay, supervisor bridges and buildings, L. & N., Evansville, Ind.; J. H. Johnston, superintendent bridges and buildings, G. T., Montreal, Que.; E. T. Howson, editor, *Railway Maintenance Engineer,* Chicago; C. W. Wright, master carpenter, L. I., Jamaica, N. Y., and G. A. Manthey, assistant superintendent bridges and buildings, D. S. S. & A., Marquette, Mich. Atlanta, Ga., was selected as the location for the next convention.

On Wednesday afternoon the members made an inspection of the Orange avenue freight terminal of the New York Central and of the ore handling docks of the Pennsylvania Lines. Following the adjournment of the convention on Thursday noon, a party visited the plant of the Goodyear Tire & Rubber Company at Akron, Ohio. The annual dinner of the Bridge & Building and the Supply Men's associations was held at the Statler Hotel on Wednesday evening.

SUPPLY MEN'S EXHIBIT

The Bridge and Building Supply Men's Association presented an exhibit in a room adjacent to the convention hall. Thirty-four firms were represented, their exhibits consisting largely of literature, photographs, etc.

The officers of this association for the past year were: President, P. C. Jacobs, H. W. Johns-Manville Company, Chicago; vice-president, Tom Lehon, The Lehon Company, Chicago; treasurer, C. E. Ward, U. S. Wind Engine & Pump Company, Batavia, Ill.; secretary, M. J. Trees, Chicago Bridge & Iron Works, Chicago; members executive committee, C. L. Cockrell, Philip Carey Company, Chicago; E. T. Howson, *Railway Maintenance Engineer,* Chicago; G. R. McVay, The Barrett Company, Chicago; W. O. Washburn, American Hoist & Derrick Company, Chicago; A. J. Filkins, Paul Dickinson Company, Inc., Chicago.

The companies exhibiting, with the nature of their displays and the names of their representatives, are as follows:

American Hoist & Derrick Company, St. Paul, Minn.; W. O. Washburn and F. J. Johnson.

American Tar Products Company, Chicago; P. J. Griffiths and S. H. Fields.

American Valve and Meter Company, Cincinnati, Ohio; models of Fenner non-freezable drop spout and Poage Style H water column; J. T. McGarry and D. J. Higgins.

Barrett Company, New York; Holt vent and leader connection; G. R. McVay and A. E. Thompson.

Bird and Company, Chicago; Mr. Caton and Mr. Inwood.

Buda Company, Chicago; bridge gang motor car; H. C. Beebe and G. E. Bryar.

Chicago Bridge and Iron Works, Chicago; illuminated photographs; H. C. Brown and F. L. Cook.

Detroit Graphite Company, Chicago; L. D. Mitchell, J. J. Hogan, W. B. Waugh and W. E. Bates.

De Vilbiss Manufacturing Company, Toledo, Ohio; W. F. Gradolph and C. D. Ward.

Paul Dickinson Company, Chicago; Arthur J. Filkins.

Dixon (Joseph) Crucible Company, Jersey City, N. J.; Dixon graphite paint; H. A. Nealley and N. C. Cameron.

Duff Manufacturing Company, Pittsburgh, Pa.; E. A. Johnson.

Fairbanks, Morse & Co., Chicago; literature; F. M. Condit, H. E. Vogel, C. B. Skelton, B. S. Spaulding, A. A. Taylor, H. E. Vergasen, Stephen Smith, J. C. Flanagan, G. Howard, G. Lang, F. M. Gardner and G. Jakers.

Heath & Milligan Manufacturing Company, Chicago; G. W. Lindholm and W. H. Pratt.

High Grade Manufacturing Company, Cleveland, Ohio; Gilso cement; S. A. Baber and J. N. Kina.

Ingersoll-Rand Company, New York; pneumatic riveter, drill and bridge repair outfit; J. N. Thorpe, Jr., and George C. Williams.

H. W. Johns-Manville Company, Chicago; asbestos roofing and pipe covering; C. E. Murphy, W. L. Laurence, J. E. Meek and H. B. Sewell.

The Lehon Company, Chicago; mule-hide roofing and shingles; Tom Lehon, D. B. Wright and Chas. V. Eades.

Luther Grinder Manufacturing Company, Milwaukee, Wis.; tool grinders; C. R. Pfeifer and Bert St. Germain.

Massey Concrete Products Company, Chicago; G. H. Redding and A. E. Humphrey.

Mudge and Company, Chicago; Jean K. Vanatta.

National Water Main Cleaning Company, New York; Burt B. Hodgman.

Nichols (George P.) & Brothers, Chicago; Geo. P. Nichols.

Patent Vulcanite Roofing Company, Chicago; asphalt shingles and roofing; A. J. Van Page.

Patterson and Sargent Company, Cleveland, Ohio; G. W. Anderson, J. K. Patterson and W. H. McBride.

Philip Carey Company, Chicago; roof coatings and shingles; C. L. Cockrell and F. R. Schueler.

Railway Maintenance Engineer, Chicago; copies of papers; E. T. Howson, H. H. Marsh and B. J. Wilson.

Railway Review, Chicago; Harold A. Smith and Charles L. Bates.

Sherwin Williams Company, Cleveland, Ohio; George G. Mowat and E. W. Lutes.

T. W. Snow Construction Company, Chicago; T. W. Snow.

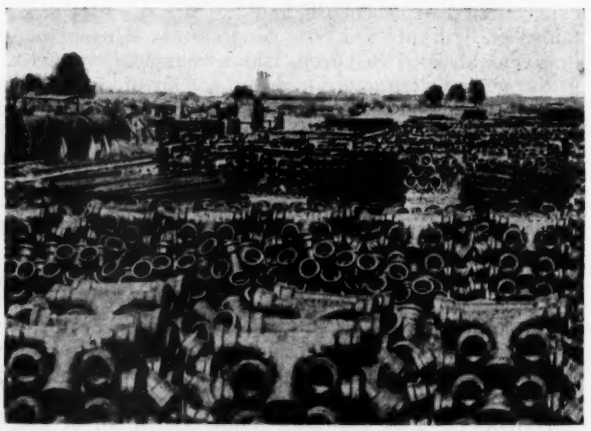
Standard Asphalt Company, Chicago; R. F. Trumbull and E. L. Hedrick.

U. S. Wind Engine and Pump Company, Batavia, Ill.; C. E. Ward.

Upson-Walton Company, Cleveland, Ohio; H. B. McCreary and E. H. Porter.

Volkhardt Company, Inc., Stapleton, N. Y.; yard and cinder pit hydrant; W. Volkhardt.

At the annual meeting on Thursday morning the following officers were elected for the ensuing year: President, Tom Lehon, the Lehon Company, Chicago; vice-president, C. E. Ward, U. S. Wind Engine & Pump Company, Batavia, Ill.; treasurer, M. J. Trees, Chicago Bridge & Iron Works, Chicago; secretary, G. R. McVay, the Barrett Company, Chicago; members executive committee, E. T. Howson, *Railway Maintenance Engineer;* Charles Thulin, Duff Manufacturing Co.; G. W. Anderson, Patterson & Sargent Company, Cleveland, O.; D. J. Higgins, American Valve & Meter Company, Cincinnati, O.; F. M. Condit, Fairbanks, Morse & Company, Chicago.



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Stock of Pipe and Fittings Sold to French Government

TWO IMPROVEMENTS ON THE JORDAN SPREADER

AMONG the devices which have been developed to combat the shortage and rising cost of labor are two improvements which the O. F. Jordan Company, East Chicago, Ind., has recently added to its spreaders to increase the range of work for which they are adapted. One of these improvements consists of the substitution of an adjustable brace on which is mounted a 12-in. air cylinder in place of the old type of rigid bar, supporting the outer end of the wing. The

Air Cylinder and Adjustable Arm Installed on Regular Spreader Wing

standard spreader allows a vertical movement of the entire wing whereby it may cut to a maximum depth of 26 in. below the top of the rail, but in the earlier designs the wing was at all times horizontal. The addition of the air cylinder on the inclined brace gives a maximum longitudinal movement to the brace of 39 in. and enables the outer end of the wing to be depressed so that it will cut a maximum of 60 in. below the rail or a slope of 34 in. in the length of the wing. This feature is particularly important in the construction of second tracks and other work where it is desired to give the top of the embankment a slope. The cylinder on the wing is connected to the main reservoir by a flexible hose to permit the vertical movement of the entire wing as before.

The second improvement consists in the addition of a ditcher wing to the spreader whereby it is enabled to ditch cuts. This wing is built to a templet designed to produce the standard ditch cross section of the road on which it is to be used. This ditching wing is attached to the spreader in place of one of the large spreading wings, being applicable to any steel Jordan spreader. It is operated by means of air from the train line through the steam valves controlling the regular wing. It will form a ditch and bank of any cross section up to 19 ft. from the center of the track and will cut a ditch with a maximum depth of 3 ft. below the top of the rail, while by building a special spreader it is possible to construct a ditch one foot deeper.

The attachment is designed for operation in two ways, depending upon the depth of the cut. When used in cuts over 7 ft. deep, the outer wing, which has a plow on the tip, is swung forward and parallel with the car, in which position it is held by two braces fastened to the tip of the wing and running to the adjustable sliding support at the forward end of the car. This support is connected to the main raising and lowering support of the attachment and works in conjunction with it, thus keeping the same relative position of the wings regardless of its height. In operation the wing is lowered sufficiently so that the pocket formed by the templet wing and the outer or carrying wing is filled by pushing the spreader through the cut, this pocket holding from six to ten cubic yards of material, depending upon the depth of the cross section of the roadbed formed. By repeating this operation, dropping the wing lower each time, the desired depth of ditch can be secured. Work is usually started at the end of the cut where the earth is to be wasted so that not more than 10 cu. yd. of earth will be moved at a time, this operation being repeated and the spreader moving back each time so that approximately the same amount of earth is carried out.

When ditching in shallow cuts the outer wing is swung out to form a continuation of the ditching wing and is held in this position by braces attached to the rear of the spreader. This extension wing can be elevated to any desired angle to give a finished slope up to one to one.

A recent extensive demonstration of this ditching attachment was made on the Gulf, Florida & Alabama, where it was operated in both shallow and deep cuts. On this railroad, where no ditches of any kind had been maintained for a considerable length of time, two and one-half miles of completed ditches were formed per hour in open cuts not over 5 or 6 feet deep where the original cross section of the roadway was about four inches higher than the tops of the ties, and the bottom of the completed ditches 36 in. below the top of rail, making approximately 18 cu. ft. of material to be moved per lineal foot of ditch.

Figuring on a basis of $125 per day for the cost of operating the ditcher, this dirt was moved at a cost of 0.17 cents per cubic yard, or at the rate of $6.25 per mile of completed ditch on one side of the track.

In deep cuts where it was necessary that the material

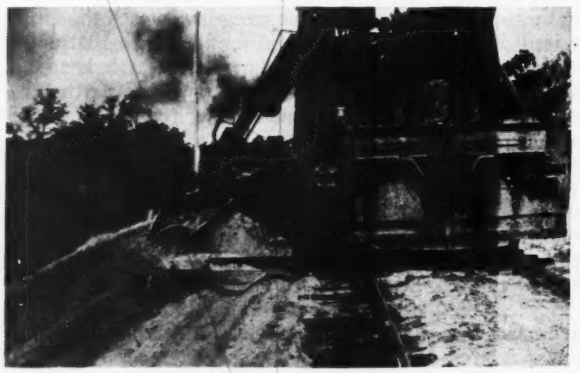
Cutting Ditch and Slope in One Operation. Shallow Cut.

be moved a considerable distance to be wasted in fills, 400 ft. of completed ditch was formed in 25 min. The dirt in this case was moved an average distance of 250 ft. at a cost of approximately 3.5 cents per cu. yd., or at the rate of $121.44 per mile of completed ditch on one side of the track where the original level of the ground in the cuts was higher than the top of the ties. The bottom of the completed ditch was three feet below the top of rail and an average amount of material removed was 18 cu. ft. per lineal foot of ditch.

The cost of making ditches by either of these methods will of course be lower where ditches have already been formed and cleaning is all that is necessary. In case of a deep cut ending at a road crossing or where for other reasons it is impossible to waste the material on fills, it may be carried to piles of from 30 to 50 cu. yd. each, which greatly facilitates handling it with a steam ditcher.

It was found during the test that 10 cu. yd. of material could be moved at a time without fouling the ballast and that the ditches formed were uniform in section, with no loose dirt left in the bottom.

The above demonstration was made with a Jordan

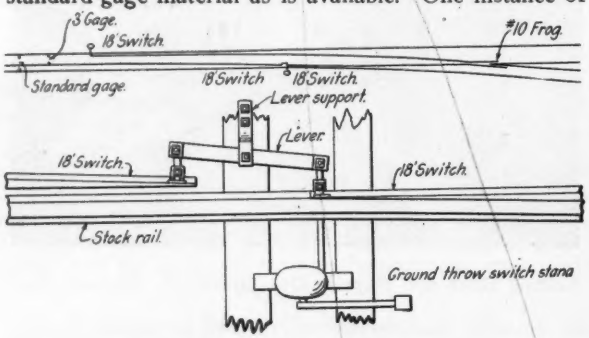


Carrying Dirt in Wing Pocket

spreader and ditching attachment leased from N. K. Snead, railroad contractor of Huntington, West Virginia, by the Gulf, Florida & Alabama and operated under the supervision of the officers of that road.

MAKING NARROW-GAGE SLIP CROSSINGS WITH STANDARD MATERIALS

THE CONDUCT of grading operations occasionally makes it necessary to cross a standard-gage main track with a narrow-gage track and while the operating rules of some railroads on important main lines prohibit the use of main tracks by the narrow-gage trains in any way, there are circumstances under which this may be permissible and it then becomes necessary to make combinations of narrow-gage and standard-gage tracks with such standard-gage material as is available. One instance of



Details of the Turnout

this kind was encountered in raising the approach to the Tennessee River bridge of the Southern Railway near Chattanooga, Tenn., where the main track was taken out of regular service and used exclusively for work train operations. It was also found desirable to use the main track for the operation of three-foot gage dump cars by the introduction of a third rail. A special problem was presented in turning this track out of the standard-gage track. A No. 10 frog was available for crossing the two near rails of the turnout, but the crossing of the other two rails with the use of a frog would have required a special frog of a much flatter angle. So it was decided to substitute two switch points to form what really is a movable-point crossing, as shown on the layout.

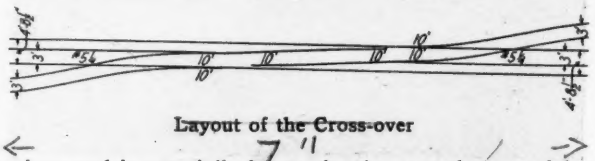
To secure rapid movement of the movable-point crossing the two switchpoints were inter-connected to a single switchstand by means of a simple lever arrangement so that the two switchpoints may be lined up for either the main track or for the narrow gage turnout with a single movement of the one switchstand lever. Another switchpoint and switchstand was, of course, necessary at the head of the turnout.

Another method of solving a problem of somewhat the same nature is given in the description below:

A COMPLICATED PROBLEM IN NARROW GAGE CROSS-OVERS

BY W. F. RENCH

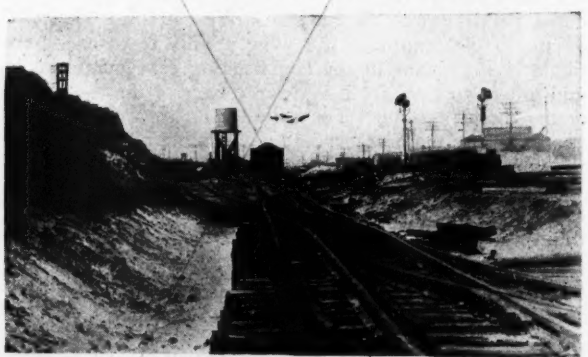
In the grading operations incident to the separation of grades on the West Jersey and Seashore at Camden, N. J., it was found desirable to occupy the entire length of a constructed standard gage track with a contractor's 3-ft. gage railway and also to cross this track. The method of effecting the slip crossing is somewhat



Layout of the Cross-over

unique and is especially interesting because the materials used consisted of standard switch points and frogs. The photograph shows the crossing, which is now in use, and the drawing indicates the detailed layout. It will be noted that the opposite rails of the steam track are employed for the dinky track on opposite sides of the crossing.

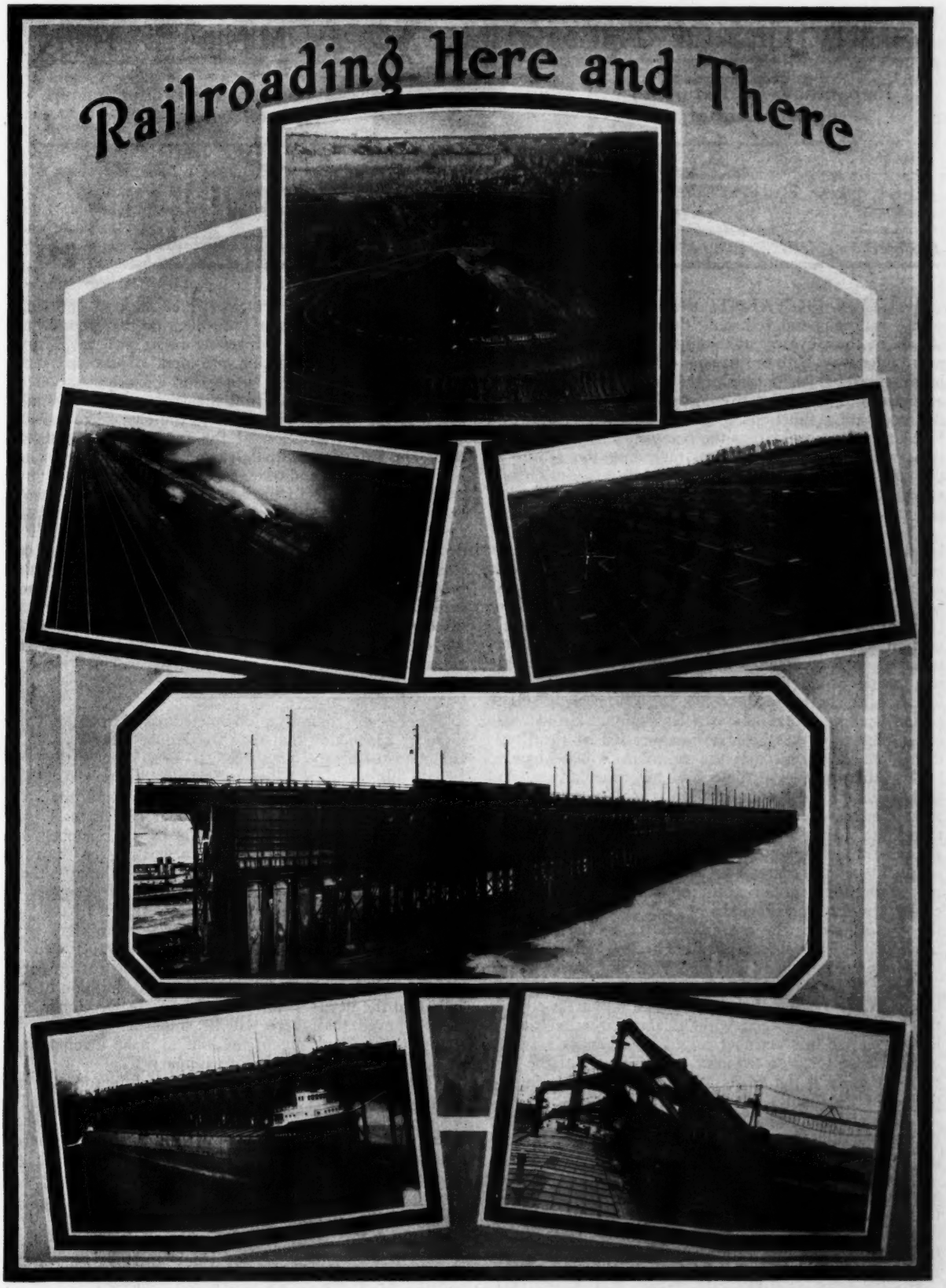
As the No. 5¼ frog on the narrow gage track makes the curve of the turnout 50 deg., which is nearly the limit for operation with 20-ton dinky locomotives, it was neces-



View of the Cross-over in Use

sary to install the work with more care than would ordinarily be used in such construction. The points, which are both a part of a switch as well as forming the movable point crossing, were separated 6 in., and the knuckle rail was made with a rail bender. A similar bend was made in the stock rails of the switches.

At two points in the standard gage track spurs occurred which were crossed by the third rail with the next larger number of frog to the one in use for the spur, a No. 10 in the case of a No. 8 turnout and a No. 6 in the case of a No. 5¼ turnout. The use of a special rod with drop lug was obviated by using a 4½-in. rail for the dinky track where it crossed the switch rods, the remainder of the work being laid with 5½-in. rail.



IRON ORE FROM THE MINE TO THE FURNACE—A TRANSPORTATION PROBLEM

Over 12,000,000 Tons of Ore Are Loaded in the Minnesota Open Pit Mines in a Year.

4,000-Ton Train on the Way to the Lakes — *Classifying Cars Ready to Go on Docks*

The Largest Ore Dock in the World, D. M. & N. No. 6 at Duluth

Loading 10,000 Tons of Ore into Boats Per Hour — *Transferring 15 Tons of Ore from Boat to Car at Each Movement*

ACTIVITIES OF THE RAILROAD ADMINISTRATION

Preparations for Return to Private Control

Statistics on Tie Production up to August 1919

Washington, D. C.

ACTIVE PREPARATIONS for unscrambling the railroads and returning them to the management of their owners at midnight of December 31 are now under way, both on the part of the Railroad Administration, which is to relinquish its control, and by the executives of the railroad companies that are to resume their operating functions. The Association of Railway Executives is representing the companies in the negotiations with the director general regarding the details of the transfer and the American Railroad Association will afford the organization through which many of the important details of the readjustment will be determined.

The idea that a delay in Congress in the enactment of legislation providing for the future regulation of the roads might operate to prevent the return of the roads on the date announced by the President last May has largely been dispelled by a letter written by Director General Hines to the chairmen of the House and Senate committees on interstate commerce urging the importance of early completion of the legislation and pointing out that it would be impracticable for the government to retain its control of the roads for a brief or indefinite period pending the adoption of legislation. He has also stated that there has been no qualification of the President's announcement that the railroads will be handed back to their owners at the end of this calendar year and that "the Railroad Administration is making all its plans to this effect with a view of making the transfer back to private management at that date with the least possible disturbance of the public service."

In spite of this statement, which Mr. Hines has made in a somewhat similar form on several occasions recently, there is still an undercurrent of apprehension on the part of some who are anxious to see the roads returned that circumstances may yet arise which will cause a change in the plans. Whether or not there is real ground for such fears remains to be seen, but they are based on the feeling that a failure of Congress to pass the legislation combined with a labor situation that is likely to arise in December might be taken as a reason or an excuse for a determination on the part of the government to hold the roads for another year or for the period of 21 months after the proclamation of peace, which is allowed in the federal control law, in the hope that, as the difficulties arising from the war are removed, government operation may yet become popular.

This idea is harbored particularly by those who have always believed that the action of the government in taking over the roads was inspired primarily by political motives. On the other hand there is also a strong belief that the administration is now very anxious to get rid of the roads and wash its hands of the entire matter.

Representatives of the railroad labor organizations that allowed their demands for further general increases in wages to be postponed in August, pending an effort on the part of the government to reduce the cost of living, are now talking about renewing them on the ground that the government is not succeeding in its efforts. Moreover, Timothy Shea, acting president of the firemen's brotherhood, has served notice, for his organization at least, that "we shall demand that there shall be established as a condition precedent to the change to private operation, the realization of the fundamental rights of labor, the living wage, the eight-hour day, time and one-half for overtime, and other principles to which the government pledged itself during the war, which have now been made a part of the treaty of peace, and which so far the Railroad Administration has never fulfilled." The demands of the trainmen and firemen are now before the Railroad Administration for decision. The engineers and conductors have not yet presented any formal demands except that for time and one-half for overtime, which the director general has been considering for several months, while the demands of the other organizations are in various stages.

Legislation

The Senate committee completed its railroad bill on October 23, but on that date the House bill was still in the hands of a sub-committee. It was expected that the Senate bill would be taken up for consideration after the league of nations debate was completed and that the House bill would be reported by about November 1.

While every effort will be made by the members of the two committees that have been working on the railroad bills throughout most of the year to secure their passage before the present extra session of Congress is adjourned, many members of Congress who have not had the same opportunity to familiarize themselves with the railroad situation feel that it is useless to try to do so before the next session and are pressing for an early adjournment. This would throw the consideration of the bills into the new session which begins in December and it is believed that there will be sufficient opposition to many of the provisions of the bills to make it impossible to secure an agreement before January 1.

The Senate bill as reported is a very different measure in many particulars from the Cummins bill as drafted by a sub-committee. The most important change which has been made is a direction to the Interstate Commerce Commission to establish rates which will produce an average return of 5½ per cent in each rate-making district, while it is authorized to add another ½ per cent for unproductive improvements. Some roads would then earn more and some less than 5½ or 6 per cent. A road earning between 6 and 7 per cent would be allowed to keep one-half of the excess above 6 per cent for a reserve fund and would contribute one-half to a general railroad contingent fund, while of earnings above 7 per cent one-fourth would go to the company fund and three-

fourths to the general fund. After a company has built up its own reserve fund to 5 per cent of the value of its property it would be allowed to keep one-third of its earnings above 6 per cent, while two-thirds would go to the general fund to be administered by a federal transportation board and to be used for the purchase of equipment and other facilities and for loans.

Provision is also made for the gradual consolidation of the railroads into 20 to 35 competing systems, and very broad powers are given both to the federal transportation board, which will take over many of the administrative functions of the Interstate Commerce Commission, and also to the commission. The indebtedness of the roads to the government for advances on capital account would be funded for a period of 10 years at 6 per cent, while a part of the indebtedness of the government to the roads for rental would be deducted from the amount. Provision is made for the adjustment of labor disputes by a board of wages and working conditions and regional boards, subject to appeal to the transportation board, and an agreement to interfere with service in connection with such disputes is made punishable by fine and imprisonment.

In general the bill undertakes to reorganize the system of railroad regulation along constructive lines and particularly to get away from the defects in the former system which made it difficult to allow adequate earnings to the weaker or average lines without at the same time giving the stronger lines what the regulating authorities regarded as excessive profits. The principle of the Cummins bill would raise the general level of rates but would take back a large part of the net income of roads that are able to make more than a "fair return" from the rates.

Railroads Prepare for Rate Advance

The railroad executives have been considerably worried for fear the roads would be returned without any legislation to safeguard the transition, but as the vital question is as to the adequacy of the revenues they have recently been turning their attention to the practical matter of getting the rates increased to a level which will represent the proper relation to the increased expenses. Since Director General Hines has announced that the government would not consider it expedient to establish any general readjustment of rates prior to January 1, 1920, suggesting that the railroad companies take such steps as they consider desirable to that end on their own account, the executives have begun preparations for filing new tariffs to be passed on by the Interstate Commerce Commission.

Director Hines conferred with a committee representing the Association of Railway Executives on this subject on October 23, at their request, and after some discussion of the position of the executives, which was reaffirmed by them, that the government itself should initiate a revision in rates, and a reiteration by the director general of his previously announced position, the executives advised the director general that they would take advantage of his offer to place at their disposal all of the information in the possession of the Railroad Administration bearing on this subject and also the service of the traffic experts of the Railroad Administration and would proceed themselves to make a study of the question with a view to filing with the Interstate Commerce Commission requests for revision of existing railroad rates.

It was thereupon resolved that the offer of the director general be accepted and immediate steps be taken by the railroad companies, with such aid, to ascertain the pertinent facts and to prepare their proposals for a readjustment of rates in such way and to such extent as will establish a proper relationship between the expenses and revenues of the railroad companies, in order that their financial needs may be adequately provided for and they be put in a position to perform efficiently their transportation duties after their properties are returned to them.

Railroads Need Development

The enormous task that the railroads have ahead of them in building up their properties to put them in a condition adequate to serve the business of the country was described by the director general in his letters to the chairmen of the congressional committees in which he said in part:

"In order to keep abreast of the growth of business in this country it is indispensable that the railroads should continue to spend large sums in the acquisition of new equipment, the enlargement and unification of terminals and the construction of additional and the enlargment of existing shops, engine houses, turn tables, etc., and in the carrying forward of normal programs for the revision of grades, construction of additional main tracks, longer and more numerous passing tracks, etc.

"In the year or two prior to the beginning of federal control this work was largely arrested by the difficulties of securing materials and labor and also by the difficulty of securing new capital. During the year 1918 this work was largely restricted to things which could be promptly done and which would have a relation to winning the war and also restricted by the scarcity of materials. The result was that comprehensive programs for developing the railroads were largely interrupted. During the calendar year 1919 there has been unavoidably an almost complete stoppage of all these matters because of the prospect of the termination of federal control and the resulting indisposition on the part of Congress to make appropriations large enough to provide for extensive improvement programs to be carried on with government funds under the general direction of the Railroad Administration.

"Hence a vast amount of work now remains to be done which the intervention of the war has necessarily delayed and accumulated, and the result is that during the year 1920 very large capital expenditures ought to be made to make up for the interruptions inevitably due to the war and to prepare the railroads to serve adequately the increased traffic throughout the country. This is particularly true as to equipment, as it seems to be reasonably certain that in the fall of 1920 there will be need for materially more freight cars than will be available if the corporations are not able promptly to make plans for the additional equipment which the government has been without provision to acquire.

"In order to make the necessary preparations for additions and betterments, including equipment, it is obvious that considerable time must be allowed for planning the improvements and for raising the money. Even the physical planning for the improvements cannot be successfully made until the legislation shall be determined upon and the improvements cannot be entered upon without knowledge as to how the money can be raised to pay for them; and the raising of the money will, of course, be dependent upon the fact and character of the legislation. Even 30 days' delay in the ability to make plans means a probably much greater delay in carrying the plans into effect, and if legislation should be so delayed as to prevent the definite making of plans until well along in the spring, the probability is that the plans could not be carried out at all in time to meet the railroad traffic requirements in the latter part of the summer and fall of 1920."

PHYSICAL CONDITION OF THE ROADS

In discussing the return of the roads, Director General Hines had this to say regarding their physical condition:

"The question has at times been raised as to whether, when the railroads are turned back on December 31, they will be in proper physical condition. This involves the question as to the maintenance of the railroads during the federal control, and that subject has had most careful attention on the part of the central and regional administrations, as well as on the part of the organizations of the federal managers.

"My judgment is, that at December 31, the physical condition of the properties will compare favorably with the condition when the properties were taken over on December 31, 1917, and this is what the government's obligation contemplates. On some particular railroad it may turn out that less maintenance of a particular sort has been done, this being due to inability to get materials during the war period, but I believe that, broadly speaking, this will be offset or more than offset by maintenance of other character which has been done, so that it is a fair general statement to say that the government will turn back the railroads in a condition required by the contract, although in specific instances there may have to be readjustments, some involving payments to the government and some involving payments by the government.

"It may be that on a balancing of all the matters which are capable of settlement the government may have to make some net outlay in cash, but the amount will at the most be a very small proportion of the amounts expended for maintenance. On the other hand, it may turn out that the cash balance will be in favor of the government."

TRANSFER OF ROADS A DIFFICULT PROBLEM

Mr. Hines also described some of the difficulties attendant upon the restoration of the railroad properties in his recent address before the state commissions at their convention at Indianapolis, when he said in part:

"We have another branch to our work which is of supreme importance. We are charged with the task, representing the United States government, of settling with the railroad corporations, after two years of occupation of property worth, perhaps, 16 to 18 billions of dollars, or more, and with perhaps 225,000 or 250,000 miles of railroads, with all sorts of incidental properties which have been included.

"You can readily appreciate the enormous responsibility and enormous difficulty that exists in the working out of a settlement of those matters.

"We devised a standard form of contract which the railroad companies and the government entered into. Those contracts are necessarily complicated, because they deal with one of the most complicated of subject matters. The questions that arise under those contracts are bewildering in number, and in their complexity, and it will be a work of supreme importance, involving hundreds of millions, and even billions, of dollars of the government money in working out a proper and just final settlement.

"Now, in addition to these problems we have another one, and that is not a small one. That is the problem of effecting the transfer of these properties back to private control. It takes but a moment's thought to see that that is a vastly more difficult problem than was that of the government taking over these properties. When these properties were taken over by the government there were all sorts of different practices on the different railroads; all sorts of agreements between the different railroad companies for joint use of particular facilities. It was perfectly easy for the government to bring in all these things and continue to observe these different practices until it had the opportunity to establish a unified method. But now, when the proposition is reversed, and it is one of terminating the unified method, and of putting back into play the old diversified methods, we have a more, a far more, difficult undertaking, and that is a thing which we must work out between now and the end of December.

Of course, with the co-operation of the railroad companies, and a thing which I am particularly anxious to accomplish, is that this transfer back to private control, despite all the difficulties that will be involved in it, shall be made without disturbing the public service, and without subjecting the traveler or the shipper to confusion or uncertainty as to how he shall conduct his business when the railroad companies resume control, which control will not be unified, and may not have the uniform practices which have prevailed during government control. So this problem is one which calls for a great deal of attention in the next two months."

ROADS EARNED SURPLUS IN AUGUST

For the second time this year the railroads earned a monthly surplus over the standard return in August, amounting to about $16,000,000. The surplus of about $2,000,000 for July will be wiped out, however, by the retroactive wage increase for the shop employees, which amounts to about $4,000,000 a month, and that amount will also have to be deducted in the final accounting from the August figures. The net operating income for August, according to reports compiled by the Operating Statistics Section for Class I roads under federal control, was $90,649,001, while one-twelfth of the standard return is $74,352,976. Operating revenues for the month increased 7.3 per cent as compared with August, 1918, and operating expenses increased 12.4 per cent.

Expenditures for maintenance of way and structures are not given in the report issued by the Railroad Administration. They are given for all Class I roads, however, in a bulletin of the Bureau of Railway Economics, and for August amounted to $68,222,897 as compared with $56,820,820 for August, 1918, and as compared with $37,260,000 during the test period. For eight months of 1919 they were $506,085,281 as compared with $399,606,175 for the corresponding period of 1918 and as compared with $273,522,000 for the test period.

NEXT YEAR'S CROSS-TIE SUPPLY

The question of the procedure to be adopted in making purchases of ties and other railroad materials and supplies which will be needed by the railroads next year and which it is necessary to order several months in advance, is still under consideration by the Railroad Administration. The question is particularly acute in the case of cross-ties, which must be ordered before the close of the year if an adequate supply is to be available for next year.

This was considered at a meeting of the chairmen of the regional purchasing committees with officers of the Division of Purchases at Washington on October 10 and 11, but no decision has yet been reached as to whether the Railroad Administration should place orders in the usual course and transfer the contracts to the railroads after the return to private management, or whether the corporations should be asked to make their own purchases for next year in the same way that Director General Hines has suggested that they make their own arrangements, with the assistance of the Railroad Administration, for proposing such general advance in freight rates as they consider necessary.

The production of cross-ties up to October 1 this year

has been about 77,000,00 and on that date the supply on hand was about 51,000,000, which indicates that there will be a carry-over into 1920 equal to the stock on hand when the railroads were taken over and that the total production for the year will be in the neighborhood of 100,000,000. Figures showing the number of ties on hand on the first of each month and the production by months this year are as follows:

	Ties on Hand		*Production*
January 1	36,556,400	January	5,803,941
February 1	41,022,816	February	7,947,464
March 1	44,084,893	March	10,188,704
April 1	49,724,748	April	10,218,237
May 1	50,087,922	May	10,841,734
June 1	49,644,767	June	9,638,200
July 1	48,918,985	July	7,598,871
August 1	50,852,075	August (est.)	7,228,764
September 1	50,814,455		
October 1 (est.)	51,000,000	Total to Sept. 1	69,465,915
		September (est.)	7,746,845
		Total (est.)	77,212,760

COTTON BELT CONTROVERSY OVER MAINTENANCE

Director General Hines has taken direct issue with one railroad president who has charged the Railroad Administration with neglecting maintenance. J. M. Herbert, president of the St. Louis-Southwestern of Texas, in a letter to the Texas Railroad Commission stated that portions of the company's track in Texas had reached a point, through failure and neglect of maintenance by the Railroad Administration, of unsafe condition for normal operation. Mr. Hines wrote to the commission on October 7 not only denying Mr. Herbert's statement but asserting that while Mr. Herbert was still in charge of the property during the first months of government control he took advantage of the fact that the government was paying the bill to order a very liberal program of maintenance. Mr. Hines said in part:

"The fact is that the St. Louis-Southwestern Railroad was maintained in exceedingly poor condition during the three-year test period, ending June 30, 1917, and was in exceedingly poor condition at December 31, 1917. The federal control act contemplates that the making of such expenditures upon a property as are necessary to return the property to the owners in the condition in which it was received by the government will constitute a full compliance with the government's obligation. Not only has this been done in the case of this railroad, but substantially more than this has been done. The best estimates which we are able to make up to the present time as to what would have constituted a full compliance with the principle of the federal control act indicate that, after making allowance for the increased cost of material and labor, there had been an over-expenditure in the maintenance of way and structures on the St. Louis-Southwestern System of $1,103,000 from January 1, 1918, to August 31, 1919, of which an over-expenditure of $247,000 was made on the St. Louis-Southwestern of Texas.

"After taking into consideration such increase in business as has taken place on this railroad, we are satisfied that we have more than fulfilled any obligation which the government owes the railroad company and that we have done enough to keep the property in safe condition notwithstanding the exceedingly poor condition of the property at the beginning of federal control.

"During the first six months of federal control, Mr. Herbert, as president of the company, remained in charge of this railroad on behalf of the government. He mapped out and issued instructions for the carrying out of a very liberal program of maintenance, stating in a letter to one of his subordinate officials the view that there was practically no limit to which the officers on the railroad could go in building up the property. After the appointment of a federal manager directly representing the government, these instructions were modified because it was not the policy of the government to build up a property at the expense of the government to a much better condition than it was when the government took it over."

In reply to this Mr. Herbert has issued a statement saying in part:

"Following a conference at Washington at the end of May, 1919, in the office of the director of the Division of Operation, at which time I stated to the director of the division and other representatives of the administration that the appropriation for the maintenance of this property for the year 1919 could not possibly continue it in a safe condition for operation, the Railroad Administration sent out from Washington two men selected from their subordinate forces at Washington, with instructions to make an inspection and report of conditions.

"These men passed over the lines of the St. Louis-Southwestern on a special train, running over much of the track at a rate of 35 to 40 miles per hour, viewing the property from an observation car. Just how they were expected to arrive at anything like an approximate estimate of the condition of the property as of January 1, 1918, in running over it on a special train during the month of June, 1919, is unexplained. Nevertheless, this expert arrives at very positive conclusions; and, in his report, states the Railroad Administration is performing its full obligation in the maintenance of this property. However, he slips to some extent on page 3 of his report, in summing up the situation, when he makes the following statement:

" 'The enforced war activity of 1918 affected the St. Louis-Southwestern as it did other railroads, and while the federal officers had authority to increase largely their expenditures for maintenance in 1918, they did not and perhaps could not always use the abnormal labor and material conditions to the best advantage in maintaining the property.'

"He further states the administration proceeded with the maintenance of way work in 1919 on the same program as in 1918 until approximately March 15, when they reduced the expenditure. He says this disarranged the season's program and led to an unbalanced and unwise expenditure of the available funds prior to the reduction, and states the result of these conditions is that, while on the whole the funds paid and appropriated for maintenance of way and structures to January 1, 1920, would be sufficient to maintain the property, it will not maintain it between the date of his report and the close of the year in safety for the operation of trains at usual speed.

"He then sets up a recommendation that an amount of $415,500 be added to the appropriation for the maintenance of this property in order to maintain it in safety, but suggests it should be done with the approval and at the expense of the corporation. In the interest of the public and the employees of the company, I suggested this additional amount be expended, and the question of charge to the corporation, or the payment of it by the administration, be left for future determination. This was declined by the administration.

"After repeated wrecks, in which employees were killed and maimed, directly traceable to inadequate inspection and maintenance, I repeated this suggestion and it was accepted; but not until the period in which maintenance work on railroads should be accomplished was almost past. To be specific, the authority given by the Washington administration to their local managers was issued September 11; and as late as the last week in September, during which I made an inspection

of the property, the additional forces had not yet been fully inaugurated."

President Herbert then tells of his own personal inspection of more than 900 miles of the Cotton Belt's tracks made in September in company with J. W. Kendrick, formerly vice-president of the Atchison, Topeka & Santa Fe, and four other maintenance of way officials. Walking more than 20 sections of main track, he says, they found 100 places unsafe for operation of trains by reason of missing spikes, broken angle bars, and worn-out ties. At one point 13 rotten ties were counted under one rail length of track.

In conclusion Mr. Herbert denies stoutly Mr. Hines' declaration that the St. Louis-Southwestern was in exceedingly poor condition when the government assumed control in January, 1918, and submits that the director general's stand that the road has been adequately maintained under federal operation is based on erroneous information and a careless inspection by the specialists sent from Washington.

DON'T OVERLOOK THE DETAILS

By John Evans

Division Engineer, Michigan Central, Detroit, Mich.

IN THESE TIMES the need for giving preference in maintenance to essential work calls for closer attention to some items, the proper care of which requires very little outlay in labor or material, but the neglect of which hastens the time when extensive repairs become necessary or shortens the service life of expensive material newly put in by expensive labor. The loose or missing bolt, the obstructed ditch or catch basin or the improperly adjusted switch soon result in the battered rail, the broken splice, the cut and broken joint tie, the muddy ballast and in the derailment which damages the track, delays operation and brings censure to the foreman and roadmaster.

The amount of labor needed to correct these conditions is so small that failure to correct them is not due so much to shortage of help as it is to insufficient or careless supervision or inspection, or to the lack of appreciation of the importance of early attention to the small details. In handling these small repairs inspection and correction should be made one operation, the man making the inspection having with him the necessary help, tools and supplies to accomplish this. Otherwise, the inspector will fail to report all defects which he finds and the laborers can be depended on to omit taking care of some of the defects which the inspector remembers to report.

In taking care of the more expensive items of maintenance work there is a tendency to postpone or omit some of the small finishing details, prompt attention to which is necessary if full and lasting benefit is to result from the work performed. As examples of work not properly completed may be mentioned the newly laid or spaced track which is not anchored, the newly put in tie which should be plated but is not, the newly overhauled switch not fully braced. These matters are often neglected when the appliances needed are on hand or could easily be obtained. There is apt to be the impression that even the little labor required in their application could be used more advantageously on other things. While such devices as anchors, plates and braces should properly be considered as essentials for efficient and economical maintenance there is, as yet, a rather widespread tendency to regard them as super-refinements. The benefits to be derived from their use follow immediately and shortage of help should, therefore, be an argument in favor of the prompt application of these devices, rather than an excuse for omitting them or delaying in putting them on.

The education of maintenance forces in the early care of small repairs is not easy in times when there is an accumulation of deferred work and facilities for caring for it are far from satisfactory. It is in such times, however, that the ounce of prevention is equivalent to the greatest weight of cure.

THE MATERIAL MARKET

THE ONE QUESTION that looms larger than anything else at the present time in the market for materials used by railroads is when and how the railroads will begin to purchase the materials which they will require next year when they are again under private management. This question has been raised primarily with respect to rails and ties and the situation in regard to the latter is dealt with in some detail in the report of the activities of the Railroad Administration appearing on another page of this issue. Nothing very definite has been reported with regard to rail, although some of the manufacturers are beginning to hint of an advance in the price.

With the continuation of the strike in the steel industry, a growing scarcity of steel commodities is rapidly developing and this is being reflected slowly in some advances in prices, although these have been of minor nature thus far. In the table of prices for new iron and steel items given below, the few increases recorded include an advance in the price of bars at Pittsburgh from $2.35 to $2.50 per hundred pounds and in the price of cast iron pipe, which has advanced from $55.80 to $59.80 per ton, Chicago.

	Prices in Cents, Per Lb., Pittsburgh	Chicago
Track spikes	$3.35	$3.62
Track bolts	4.35	4.62
Angle bars	2.75	2.75
Tie plates, steel	....	2.75
Tie plates, iron	....	2.90
Wire nails	3.50	....
Barbed wire, galvanized	4.25	....
Cast iron pipe, 6 in. or larger, per ton	....	59.80
Plates	2.65	2.92
Shapes	2.45	2.72
Bars (steel)	2.50	2.72

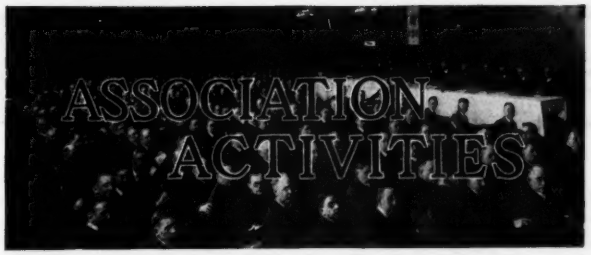
Prices in the scrap market also continue to advance slowly, as indicated by the schedule of scrap prices given below:

	Pittsburgh	Chicago	St. Louis
	Per Gross Ton		
Rail, rerolling	$25-$26	$28.00-$28.50	$26.50-$28.00
Rail, less than 3 ft. long		21.50- 22.00	22.50- 23.00
	Per Net Ton		
Angle bars, steel		19.50- 20.00	19.00- 19.50
No. 1 railroad wrought	$22-$23	22.50- 23.00	21.00- 21.50

In the lumber market the prices seem to have reached a maximum level and manufacturers are inclined to think more of the satisfactory condition of the market at present rather than of further advances to come. A comparison of quotations this month with those of last month shows many items in which no changes have taken place, together with a few in which there has been an advance of $2 or $3, as well as a considerable number, especially among boards and dimension timbers, in which there has been a lowering of the prices of approximately the same amount. The car shortage continues to be an important obstacle in the movement of forest products.

The price of Portland cement has not changed in the past month and current quotations at eight cities in the middle west are given below, prices being price per barrel in carload lots not including package:

Chicago	$2.00	Cleveland	$2.32
Pittsburgh	2.05	Indianapolis	2.27
Milwaukee	2.11	Duluth	2.10
St. Paul	2.25	Toledo	2.12



WOOD PRESERVERS' ASSOCIATION

The Executive Committee of the American Wood Preservers' Association met at the Hotel Sherman, Chicago, on Saturday, October 25, to receive reports of committees and to prepare for the convention which will be held at the same hotel on February 10-12, 1920.

Members of the Service Records committee of this association, in conjunction with members of the Committee on Wood Preservation of the American Railway Engineering Association, have spent considerable time during the past month in inspecting treated bridge timbers on the Louisville & Nashville, the Santa Fe, the Southern Pacific and other lines along the Gulf of Mexico. A similar party of members of these committees left Chicago on October 26, to inspect the condition of ties and other treated timbers on the Puget Sound extension of the Chicago, Milwaukee & St. Paul and other roads in the Northwest.

AMERICAN RAILWAY ENGINEERING ASSOCIATION

The committees are making strenuous efforts to complete their reports and turn them over to the secretary in order that they may be distributed to the members well in advance of the convention. As a result more than the usual number of meetings have been held during the past month and others are scheduled for the month of November. Among the more important meetings were a two-day session of the Committee on Stresses in Track at Chicago on October 27 and 28, at which an elaborate and extensive report was submitted to the committee by Professor A. N. Talbot, chairman, and the meeting of the Rail committee on October 29, at which the revision of rail specifications, submitted tentatively to the association at the last convention, were up for consideration.

A special committee of 10 members of the Committee on Yards and Terminals left Chicago on October 1 for a detailed study of the operation of the Puget Sound terminals. This committee spent three days in conference with terminal officers at Tacoma and four days at Seattle, as a result of which an elaborate report has been presented for incorporation with similar information received from the regional directors relative to the operation of other terminals throughout the country.

The Committee on Economics of Railway Labor has called a meeting at Chicago, November 7, while the Standardization Committee will meet in New York, November 11. The Track Committee has called a two-day meeting at Pittsburgh, Pa., on November 11 and 12.

MASTER PAINTERS' ASSOCIATION

The Maintenance of Way Master Painters' Association held its sixteenth annual convention at St. Louis, Mo., on October 21, 22 and 23, with 30 members present, besides a considerable number of non-members interested in the work of the association. The officers of the association for the past year were: President, H. E. Conrad, P. R. R., Huntingdon, Pa.; first vice-president, H. F. Jones, C. C. C. & St. L., Wabash, Ind.; second vice-president, Ole Substad, C. & N. W., Winona, Minn., and secretary-treasurer, F. W. Hager, F. W. & D., Fort Worth, Tex. The principal subjects for discussion at this convention were tools and equipment and labor-saving devices, including the spray method of applying paint. The labor situation, with special reference to the possibility of developing apprentice systems or vocational training, was also accorded earnest consideration. The next convention will be held at Detroit, Mich., on October 5, 6 and 7, 1920, this date being selected to avoid conflict with the convention of the Bridge and Building Association.

The officers elected for the coming year were: President, H. F. Jones, C. C. C. & St. L., Wabash, Ind; first vice-president, H. B. Wilson, B. & L. E., Greenville, Pa.; second vice-president, Bert E. Darrow, A. T. & S. F., Kansas City, Mo.; and secretary-treasurer, E. E. Martin, U. P., Kansas City, Mo. A detailed report of this convention will be presented in the December issue.

ROADMASTERS' ASSOCIATION

A meeting of the members of the Executive Committee of the Roadmasters' and Maintenance of Way Association will be held at the Claypool Hotel, Indianapolis, Ind., on Saturday, November 8. At this meeting the personnel of the committees for the ensuing year will be determined and arrangements made for undertaking aggressively the work of the association next year.

MAINTENANCE OF WAY CONVENTIONS

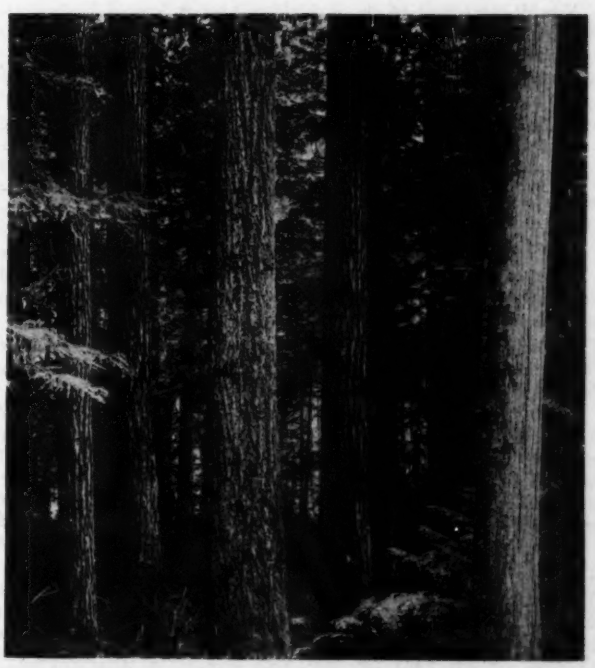
American Railway Bridge and Building Association, C. A. Lichty, secretary, C. & N. W., Chicago. Next annual convention, Atlanta, Ga., October 19-21, 1920.

American Railway Engineering Association, E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next annual convention, Congress Hotel, Chicago, March 16-18, 1920.

American Wood Preservers' Association, F. J. Angier, secretary, Mount Royal Station, Baltimore, Md. Next annual convention, Hotel Sherman, Chicago, February 10-12, 1920.

Maintenance of Way Master Painters' Association of the United States and Canada, E. E. Martin, secretary, Room 19, Union Pacific Building, Kansas City, Mo. Next annual convention, Detroit, Mich., October 5-7, 1920.

Roadmasters' and Maintenance of Way Association of America, P. J. McAndrews, secretary, C. & N. W., Sterling, Ill. Next annual convention, St. Louis, Mo., September 21-23, 1920.



The Forest—Our National Heritage

GENERAL NEWS DEPARTMENT

Opposition to the Plumb plan by a vote of four to one is reported by the American Association of Engineers, which took a referendum of its membership on this question.

A request for more pay for engineers in government service has been made to Congress by the Secretary of Commerce. While the appeal was made in connection with the request for higher pay for the technical staff of the Coast and Geodetic Survey, the low salaries prevailing there are being cited as typical of a condition which exists throughout the government service.

The Western Society of Engineers, Chicago, as a result of an intensive drive for increased membership, obtained over 2,000 applications for admission from engineers located largely in the City of Chicago in the week ending October 17. As a result of this impetus to the society's activities, a railway engineering section will be organized to hold a meeting in the society's rooms in the Monadnock building each month for discussions of railway problems.

The East St. Louis (Ill.) organization of the Federated Shop Crafts recently adopted a resolution calling upon railway men throughout the country to give one day's pay each month for the benefit of striking steel workers. The resolution has been forwarded to the secretary of the railway employees' department of the American Federation of Labor after being endorsed by the Federated Shop Crafts.

The next United States census will include a reclassification of engineers so that technical engineers will be listed separately and distinctly from non-technical engineers (stationary engineers, locomotive enginemen, etc.), and will enable anyone to ascertain readily the number of technical men in the United States and in each state. Technical engineers will be further subdivided between civil, mechanical, electrical and mining.

The American Association of Engineers has ordered all of its local organizations to request that every member of the association telegraph Joseph P. Tumulty, secretary to the President, urging the appointment of an engineer to the vacancy upon the Interstate Commerce Commission. F. H. Newell, president of the American Association of Engineers, recently petitioned the President to appoint an engineer to the vacancy, and the new action is taken as a result of reports that the President is considering the appointment of a lawyer.

During the month of September 84.3 per cent of all the passenger trains operated on the railroads under federal control arrived at their terminals on time. This compares with the record in August of 83.0 per cent, which was adversely affected by various unauthorized strikes of shopmen. The best regional record during the month of September was that of the Allegheny region with 88.7 per cent of its trains on time, while the lowest record was that of the Central Western region, in which 76.6 per cent of the trains were on time.

Plans for grade separation and rearrangement of railway terminal facilities at Seattle, Wash., have been proposed by the City Council through a resolution providing for a conference between representatives of the Board of Public Works, the railroads and property owners. At present nearly all of the railway property is on the street level, so that there are many grade crossings. It is believed that the rearrangement of the railway facilities will accomplish the separation of grades at a considerable reduction in cost as compared with the elevation or depression of the facilities as now existing.

Renewed attention has been given to the question of grade crossing elimination in the City of Chicago through a report recently published by the county coroner showing that the deaths due to crossing accidents have increased during the last six years in spite of the fact that nearly $100,000,000 has been spent by the railroads entering the City of Chicago for track elevation. Deaths due to grade crossing accidents had been reduced in 1912 to 52, as compared to 100 in 1906, but the number has since gradually increased to 79 in 1918. Since the presentation of this report Alderman D. M. Maypole, chairman of the City Council's committee on track elevation, has directed the engineer of track elevation to make a survey of all grade crossings in the City of Chicago for

A bill to regulate the manufacture, sale, purchase and use of explosives has been introduced in the United States Senate by Senator Nelson of Minnesota. The bill is very stringent in its provisions and apparently would place a considerable hardship on those who make legitimate use of explosives in construction work. The bill provides that after its passage, every person who manufactures, distributes, stores, purchases, sells, uses or possesses powder, explosives, blasting supplies or ingredients thereof, shall register with the collector of internal revenue in his district his name and place of business, pay a special tax, and secure a license, which shall be annually renewed on the payment of a fee.

From October 18 to the end of the month, all railroads in the country were bending their efforts to make a good record in the national railroad accident prevention drive. The drive was conducted so that there was competition not only between the railroads of the several regions, but also between the various regions of the Railroad Administration. While the general idea of the drive was the same the country over, the individual railroads were allowed considerable latitude in the manner of conducting the drive so as to create and maintain an active interest in the prevention of accidents through the drive period. As an illustration of what has been done along this line, R. H. Aishton, regional director of the Northwestern region, informed the safety section of that division that he will award an attractively designed safety banner to the road employing more than 2,000 men and another to the road employing less than 2,000 men which obtains the best record in the drive.

While a permanent immigration policy will probably not be developed by Congress before next year, it is believed that some arrangements will be made to extend the present wartime restrictions on the admission of aliens for one year following the formal proclamation of peace. Under the present regulations, a prospective immigrant must obtain a passport from his government and then secure a visé from a consul of the United States, who is under instructions to bar out all undesirables rigidly. By far the largest numbers of immigrants last year were English and Mexicans. The distribution by races is shown in the following figures:

	Admitted	Departed	Increase or Decrease
African (black)	12,262	4,004	8,253
Bulgarian, Serbian, Montenegrin.	439	3,373	2,934
Chinese	7,426	7,930	504
Cuban	4,573	4,138	435
Dutch and Flemish	5,567	5,704	137
English	45,564	28,223	17,341
French	21,243	11,965	9,278
German	2,177	519	1,658
Greek	1,502	16,437	14,935
Hebrew	3,660	538	3,122
Irish	10,146	3,159	6,987
Italian (north)	2,918	1,870	1,048
Italian (south)	5,981	40,621	34,640
Japanese	14,904	11,233	3,671
Mexican	44,776	26,557	18,219
Polish	1,037	10,109	9,072
Portuguese	2,079	4,158	2,079
Russian	2,039	2,525	486
Scandinavian	13,163	9,240	3,923
Scotch	14,262	3,868	10,394
Slovak	116	1,175	1,059
Spanish	7,813	11,567	3,754
Spanish American	5,414	3,098	2,316
Welsh	965	277	688
West Indian (except Cuban)	2,947	1,442	1,505

PERSONAL MENTION

GENERAL

Lee Jutton, division engineer of the Wisconsin division of the Chicago & Northwestern, with headquarters in Chicago, has been promoted to trainmaster on the Madison division with headquarters at Madison, Wis.

W. R. Smith, general manager and chief engineer of the Edmonton, Dunvegan & British Columbia, the Alberta & Great Waterways Railway and the Central Canada, with headquarters at Edmonton, Alberta, has also been appointed traffic manager, in place of **C. Dowling,** who has resigned.

W. J. Cunningham has resigned as assistant director of the Division of Operation, effective on September 15, to return to his work at Harvard as James J. Hill professor of transportation. Mr. Cunningham organized and was appointed manager of the Operating Statistics Section early in 1918 and was appointed assistant director of the Division of Operation, and also chairman of a special committee on maintenance expenditures, on June 1 of this year.

C. F. Urbutt, district engineer of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been appointed trainmaster on the Sioux City and Dakota division, with headquarters at Sioux City, Ia. Mr. Urbutt formerly held the positions of assistant engineer and engineer of track elevation on that road with headquarters at Chicago. He entered military service in 1917 and received a commission as lieutenant with the construction quartermaster's forces. Upon his return to civil life he was assigned to special duties in the engineering department of the Chicago, Milwaukee & St. Paul, with which he was occupied until his appointment as district engineer in March, 1919.

Lewis W. Baldwin, operating assistant to the regional director of the Allegheny region, who has been appointed regional director succeeding **C. H. Markham,** received much of his training in engineering and maintenance of way work. Mr. Baldwin was born at Waterbury, Md., on February 26, 1875, and graduated from Lehigh University in 1896. He entered railway service in July, 1896, with the Illinois Central, and served consecutively as chainman, rodman and assistant engineer until June, 1898. He was then assistant engineer on maintenance work for three months and from September, 1898, to January, 1900, served as assistant engineer on location and construction. The following year he was supervisor of track, and in February, 1901, was promoted to roadmaster, a position he held until September, 1904. Mr. Baldwin served as trainmaster from 1904 to April, 1906, and as superintendent for the succeeding four years. He was appointed engineer maintenance of way at Chicago in May, 1910, and superintendent of the Kentucky division in April, 1913. In January, 1915, he was promoted to general superintendent of all lines south of the Ohio River, and in November, 1915, was appointed general manager of the Central of Georgia. Mr. Baldwin was elected vice-president and general manager of this road in October, 1916, and served in this capacity until February, 1918, when he was appointed operating assistant to the regional director of the Allegheny region, which position he held until his recent appointment.

Lewis W. Baldwin

Ralph Budd, executive vice-president of the Great Northern, who has been made president succeeding **Louis W. Hill,** is a railway engineer of extended experience. Mr. Budd was born at Waterloo, Iowa, on August 20, 1877, and received his education at Highland Park College of Engineering at Des Moines, Iowa, from which he graduated in 1899. Following his graduation he entered railway service with the Chicago Great Western and was consecutively draftsman, rodman, levelman, instrumentman and assistant engineer until 1902. From that date until 1905 he served successively as roadmaster, general superintendent of construction and division engineer on the St. Louis division. He was then transferred to Chicago as division engineer and the following year was appointed chief engineer of the Panama Railroad at Colon, Panama, in which position he remained until 1909, when he went to the Oregon Trunk as chief engineer. From 1910 to May, 1914, Mr. Budd was chief engineer of the Spokane, Portland & Seattle, and from 1911 to January, 1913, he also served as chief engineer of the Spokane & Inland Empire and the Spokane Traction Company at Portland, Ore. On January 1, 1913, he was appointed assistant to the president of the Great Northern and on February 15 was appointed chief engineer. He was again appointed assistant to the president on May 1, 1914, which position he held until his election as vice-president in February, 1919.

ENGINEERING

S. L. McClanahan has been appointed division engineer of the Colorado division of the Chicago, Rock Island & Pacific, with headquarters at Colorado Springs, Colo., in place of W. E. Brown, transferred.

W. H. Oliver, division engineer on the Atchison, Topeka & Santa Fe Coast Lines, with headquarters at San Bernardino, Cal., has been promoted to engineer of the grand division, with headquarters at Los Angeles, Cal.

H. S. Clarke has been appointed division engineer of the Pennsylvania division of the Delaware & Hudson, with headquarters at Carbondale, Pa., succeeding **J. C. Dorsey,** transferred to division engineer of the Saratoga division, with headquarters at Albany, N. Y.

A. M. MacGillivray, resident engineer on the Canadian National, with headquarters at Port William, Ont., has been promoted to district engineer, with headquarters at Saskatoon, Sask., succeeding **H. L. Vercoe,** who has been assigned to other duties.

W. A. Wallace, division engineer on the Chicago, Rock Island & Pacific, with headquarters at Eldon, Mo., has been transferred to the Nebraska division with headquarters at Fairbury, Neb.

J. C. Wrenshall, Jr., has returned to the position of division engineer of the Philadelphia & Reading at Spring Garden Street, Philadelphia, Pa., succeeding **W. G. Wieand,** acting division engineer, who has returned to the position of supervisor, as noted elsewhere.

William Gerig, engineer in charge for the Alaskan Engineering Commission at Anchorage, Alaska, has been appointed assistant chief engineer for the commission with the same headquarters, succeeding **William C. Edes,** chairman of the commission and chief engineer, who retains his office as chairman.

W. A. Parker, division engineer of the Kansas division of the Union Pacific, with office at Marysville, Kan., has been appointed assistant engineer maintenance of way, with headquarters at Omaha, Neb. **W. H. Lowther,** division engineer of the Idaho division of the Oregon Short Line, has been appointed to succeed Mr. Parker.

Henry F. Merker has resigned as engineer maintenance of way of the East St. Louis & Suburban, with office in St. Louis, to become chief of construction of the new plant which the St. Louis Coke & Chemical Co., St. Louis, Mo., is erecting in Granite City, Ill. **S. Clay Baker,** assistant engineer of construction on the East St. Louis & Suburban,

with headquarters in St. Louis, has been appointed engineer maintenance of way succeeding **Mr. Merker.**

Captain Thomas G. Banks has been discharged from military service and has resumed his duties as division engineer of the Oklahoma district of the Missouri, Kansas & Texas, with headquarters at Oklahoma City, Okla. Captain Banks, who was commissioned a second lieutenant in the Engineer Officers Reserve on April 23, 1918, was promoted to the rank of first lieutenant on August 31, 1918, and to captain on May 2, 1919.

B. A. Wait, assistant engineer on the First district of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Iowa, has been promoted to division engineer of the Cedar Rapids division, with headquarters at Cedar Rapids, Iowa, succeeding **Garrett Davis,** assigned to other work. Mr. Wait was born at Easthampton, Mass., in 1868, and graduated from the University of Illinois in 1892. He entered railway service in June, 1888, with the Illinois Central, and since that time has held various positions with the Chicago & North Western, the Chicago, Burlington & Quincy and the Gulf, Colorado & Santa Fe. In August, 1904, he entered the employ of the Chicago, Rock Island & Pacific, and served in various capacities until his recent appointment.

F. W. Hillman, division engineer of the Madison division of the Chicago & North Western, with headquarters at Madison, Wis., has been transferred to the Wisconsin division with office at Chicago, succeeding **Lee Jutton,** who has been transferred to the operating department, with headquarters at Madison, Wis., as noted elsewhere. **J. A. Dyer,** division engineer of the Southern Illinois division with headquarters at South Pekin, has been transferred to Madison to succeed Mr. Hillman, and **J. D. Irving,** assistant engineer with office at Boone, Iowa, has been promoted to division engineer at South Pekin, succeeding Mr. Dyer. Mr. Irving was born at Clyman, Wis., on June 4, 1880. He received his education at the University of Wisconsin and entered railway service in June, 1905, with the Chicago & North Western as an instrumentman. Since 1905 he has been successively assistant engineer and assistant division engineer in charge of construction, location and maintenance, until his recent appointment.

C. T. Jackson, district engineer of the Chicago, Milwaukee & St. Paul, with headquarters at Butte, Mont., has been transferred to Chicago, succeeding **C. F. Urbutt,** appointed trainmaster, as noted elsewhere. Mr. Jackson is succeeded at Butte, Mont., by **F. M. Sloane,** field engineer in the valuation department, whose headquarters have been at Chicago. Mr. Sloane graduated from Iowa State College in 1906, and entered the employ of the Keokuk & Hamilton Water Power Co. He left this concern in 1907 and accepted a position with the Chicago Sanitary District as levelman. In September, 1907, he entered railway service with the Chicago, Milwaukee & St. Paul as a rodman and in 1911 was promoted to assistant engineer. He left this road in 1912 to go with an irrigation company in Arizona as assistant engineer, but returned a few months later and served as general concrete foreman on double track work then in progress between Minneapolis and Aberdeen. In 1913 Mr. Sloane was transferred to Minneapolis as general foreman of track depression work at Minneapolis. From 1916 to June, 1918, he served as pilot engineer on valuation work and was promoted to field engineer on the latter date, which position he held until his recent promotion.

G. P. MacLaren, whose appointment as district engineer of the Ontario district of the Canadian National Railways with office at Toronto was announced last month, was born at London, Ont., in April, 1878, and was educated in the London Collegiate and Huron College. He entered railway service in the summer of 1897 on the Springbank Electric Railway, and from 1898 to 1899 was a draftsman on the Algoma Central. In 1899 he became resident engineer on the Lake Erie & Detroit River, now a part of the Pere Marquette, and the following year he entered the service of the Halifax & South Western, now a part of the Canadian National, where he served as levelman, transitman, resident engineer and division engineer. In 1906 he became division engineer of the Canadian Northern at Quebec, and later at Port Hope. In 1911 he was appointed district engineer of the North Bay district of that road, and in 1916 was promoted to the position of division engineer of the Toronto division, from which position he enlisted in June, 1916, for duty overseas and served in France until the end of the war as chief engineer, 10th Battalion, Canadian Railway Troops. Upon his return he was appointed district engineer, as mentioned above.

Leonard L. Sparrow, office engineer of the Atlantic Coast Line, has been promoted to principal assistant engineer with headquarters at Wilmington, N. C., succeeding **T. L. Morton,** deceased. Mr. Sparrow was born at Philadelphia, Pa., in November, 1872, and is a graduate of the University of Tennessee. He entered the employ of the Baltimore & Ohio in 1895, serving as rodman on the Philadelphia division. In 1906 he was transferred to the Second division, with headquarters at Martinsburg, W. Va. From 1899 to 1904 he served as assistant engineer and resident engineer on surveys and grade reduction work. In May, 1904, he left the Baltimore & Ohio to take charge of the construction of terminals for the Atlantic Coast Line at Jacksonville, Fla., remaining in that position until 1907, when he was appointed engineer of roadway on the First division, with headquarters at Rocky Mount, N. C., being transferred in August, 1908, to the Third division with office at Jacksonville, Fla., in charge of maintenance of all this company's lines in Florida. In September, 1917, he was appointed office engineer in the office of the chief engineer at Wilmington, N. C., which position he held at the time of his recent appointment.

Fred A. Bordwell, who was appointed division engineer of the San Joaquin division of the Southern Pacific, with headquarters at Bakersfield, Cal., as noted in last month's issue, was born at San Francisco, Cal., on January 2, 1876. He received his education at the University of California and entered railway service in September, 1899, with the Southern Pacific. From 1899 to 1906 he served as assistant engineer and assistant division engineer, and in 1907 was promoted to division engineer on the Tucson division. In 1908 he left the Southern Pacific to engage in private practice in Tucson, Ariz., and after three years entered the employ of the Southern Pacific in Mexico as assistant engineer in charge of track construction. In 1913 he returned to the Southern Pacific in the capacity of assistant division engineer in California. He was with the United States army in France as a captain of engineers from June, 1918, to July, 1919, at which time he received his discharge and was appointed division engineer, as noted above.

TRACK

B. E. Conlan, roadmaster on the Western Pacific, with office at Portola, Cal., has been appointed roadmaster on the third and fourth districts of the Denver & Rio Grande, with headquarters at Walsenburg, Colo., succeeding **Richard Hughes,** who has resigned.

W. G. Wieand, acting division engineer of the Philadelphia & Reading at Philadelphia, has returned to the position of supervisor at Landsdale, Pa., in place of **A. P. Crosley. C. B. Harveson,** recently returned from military service, has been appointed supervisor at Olney, Philadelphia, Pa., succeeding **C. D. Addams,** acting supervisor, who becomes assistant supervisor at Landsdale. Mr. Crosley has been appointed assistant supervisor at Trenton Junction, N. J., vice **R. E. Young,** transferred to Spring Garden street, Philadelphia, in place of **W. S. Sloatman,** assigned to other duties.

D. F. Mulkern, roadmaster on the Great Northern, with headquarters at Great Falls, Mont., has been appointed division roadmaster temporarily of the Havre division, with headquarters at Havre, Mont., in place of **R. Hughes,** granted leave of absence. **H. Petry** has been appointed roadmaster temporarily of that part of the Havre division from Pacific Junction to Cut Bank, Mont., with headquarters at Cut Bank, succeeding Mr. Mulkern. **James Sullivan, Jr.,** has been appointed roadmaster of that portion of the Kalispell division from Cut Bank to Essex, Mont., with headquarters at Essex, in place of **Joseph D. Boyes,** transferred.

W. E. Brown has been appointed roadmaster on the Nebraska division of the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., in place of **W. H. Ogelvie,** assigned to other duties. **R. Blank** has been appointed roadmaster on the Dakota division, with headquarters at Dows, Iowa, succeeding **J. Colles,** resigned.

BRIDGE

F. Kirk has been appointed master carpenter on the Dakota division of the Chicago, Rock Island & Pacific, with headquarters at Estherville, Iowa, succeeding **S. P. Perkins,** resigned.

Floyd E. Bates, assistant engineer in the bridge department of the Missouri Pacific, with headquarters at St. Louis, Mo., has been promoted to assistant bridge engineer with the same headquarters, succeeding **W. B. Hudson,** who resigned to join the organization of C. E. Smith & Co., consulting engineers, St. Louis, Mo. Mr. Bates was born at Allison, Iowa, in 1889, and received his education at the University of Wisconsin. In 1910 he entered railway service with the Chicago, Milwaukee & St. Paul as a draftsman in the bridge department. He left this road in 1912 to go with the Kansas City Terminal Railroad as a designer, but returned to the Chicago, Milwaukee & St. Paul in 1913 as a squad foreman in the bridge department. In 1912 he served as bridge designing engineer in the bridge department of the City of Chicago, and in 1914 was appointed assistant engineer in the bridge department of the Missouri Pacific, which position he held until his recent appointment.

PURCHASING AND STORES

F. E. Outerbridge has been appointed storekeeper of the Detroit & Toledo Shore Line Railroad with headquarters at Lang, Ohio.

F. A. Hamilton, assistant purchasing agent for the Portland Gold Mining Company, Colorado Springs, Colo., has been appointed purchasing agent of the Colorado Springs & Cripple Creek District Railway, with office at Colorado Springs, succeeding **F. W. Baker,** who has resigned to become purchasing agent for the Midland Terminal, with headquarters at Colorado Springs.

C. B. Porter has been appointed acting purchasing agent of a group of roads with headquarters at Dallas, Tex., succeeding **R. L. Irwin,** general purchasing agent, who has been granted a leave of absence. These roads include the Texas & Pacific; the International & Great Northern; the Galveston, Houston & Henderson; the Houston & Brazos Valley; the Trans-Mississippi Terminal; the Weatherford, Mineral Wells & Northwestern; the Gulf, Texas & Western; the Denison & Pacific Suburban; the Fort Worth Belt; the Gulf, Colorado & Santa Fe; the Atchison, Topeka & Santa Fe (Pauls Valley, Lindsay and surplus districts only); the Texas Midland; the Beaumont, Sour Lake & Western; the Houston Belt & Terminal; the Iberia, St. Mary's & Eastern; the New Iberia & Northern; the New Orleans, Texas & Mexico; the Orange & Northwestern; the St. Louis, Brownsville & Mexico; the Galveston Wharf Company; the Fort Worth Union Passenger Station, and the Union Terminal of Dallas.

OBITUARY

Walter H. Graves, formerly chief engineer of the Oregon Short Line, died suddenly at Salinas, Cal., on September 26, at the age of 62 years.

Patrick Laden, district engineer on the Illinois Central, with headquarters at Waterloo, Iowa, died at his home in Rockford, Ill., on October 13, following a stroke of apoplexy. Mr. Laden was born in 1862 and entered railway service with the Illinois Central in 1887 as an extra gang foreman. In 1888 he was promoted to road supervisor, with office at Rockford, Ill., and in 1889 was promoted to roadmaster on the Mississippi division with headquarters at Jackson, Tenn. He served as roadmaster on various other divisions until 1907, at which time he was appointed division superintendent, with headquarters at Mattoon, Ill. In 1912 he was appointed district engineer of the Northern and Western lines, with office at Waterloo.

CONSTRUCTION NEWS

The Atchison, Topeka & Santa Fe has awarded a contract for the building of a 15-mile line from Porterville, Cal., to Ducor, to the Sharp & Fellows Contracting Company, Los Angeles, Cal.

This road is constructing a branch road from its main line at Shattuck, Okla., to Spearman, Tex., 70 miles of the 84 miles of which have been completed. The line is through the upper part of the Panhandle and affords a transportation outlet for a wide stretch of wheat-producing territory that was formerly 50 to 75 miles from the nearest railroad point. It is not expected that the line will be extended beyond Spearman for some time.

The Canadian National Railways have let contracts for building about 410 miles of line as follows: To Grant, Smith & McDonell, Ltd., of Calgary, Alta., 25 miles on the Arcadia Valley branch; the Western Construction Company, Ltd., of North Battleford, Sask., 21 miles on the Jackfish Lake branch from mile 61.95 to mile 83, and on the Luck Lake branch from mile 13.64 to mile 35, a distance of 21.36 miles; on the Peebles-Lampman branch 20 miles have been let to the Canadian Construction Company, Ltd., of Winnipeg, Man.; on the Swift Current branch 27 miles from mile 92 to mile 120, to Gibbs Brothers of Gravelbourg, Sask.; on the Peace River branch, 38 miles, beginning at mile 34, to Malcolm McCrimmon & Son, of Edmonton, Alta.; on the Thunderhill branch, 9 miles, from mile 100, to D. R. & D. J. McDonald of Netherhill, Sask.; on the Munson-Wayne branch a contract has been let for double tracking from mile 312 to mile 322, to J. Manning, Drumheller, Alta., and on the Rosebud Creek diversion, the Carter-Halls-Aldinger Company, Ltd., of Winnipeg, has a contract for the Calgary subdivision. The Canadian Construction Company, Ltd., also has received contracts for two extensions on the Hanna-Medicine Hat branch for a total of 88 miles, and J. W. Stewart & Co. of Winnipeg has received contracts covering 150 miles of construction on the following branches: 35 miles on the Eston South Easterly, 30 miles on the Melfort North East, 28 miles on the Melfort-Humbolt branch, 15 miles on the Amaranth extension, 22 miles on the Oliver North East branch, and 20 miles additional on the Amaranth extension to Ste. Rose du Lac North.

This system has nearly completed its new branch line extending from Peace River Junction, Alta, to Whitecourt, a distance of 78 miles. Freight service is in operation from Peace River Junction to Sanguda, a distance of 31 miles, and grading and preparation for track laying have been comcompleted to Whitecourt.

The Chicago & Eastern Illinois has started work on a combined passenger station and freight house at Salem, Ill. It is to be a one-story structure, 28 ft. by 108 ft., and will cost approximately $20,000. The contractor is T. S. Leake & Co., Chicago, who expects the work to be completed by December.

The Chicago, Milwaukee & St. Paul has started work on an addition to its yards at Sioux City, Iowa, involving an expenditure of $25,000.

The Chicago, Rock Island & Pacific is making preparations to extend the Chattanooga (Okla.) branch southward 15 miles to Grandfield, Okla., on the Wichita Falls & Northwestern. This branch connects with the Enid-Waurika line at Lawton, Okla.

The Rock Island is now replacing its bridge crossing the Des Moines river, south of Des Moines, Iowa. The work consists of replacing four 150-ft. through trusses with three 150-ft. riveted through truss spans of heavier design and a pile approach.

This road has also received bids for the construction of a double-track bridge across the Des Moines River at Eldon, Iowa. The structure will have a total length of 1,006 ft. and will consist of eight concrete arch spans of 93 ft. and one

of 46 ft. and two 44-ft. deck plate girders with concrete decks. The new structure will replace a single-track bridge of through truss spans and will be built on new concrete piers. The grade of the new bridge will be approximately five feet above that of the existing structure.

The Cisco & Northeastern, a new road which the Cisco Banking Company, Cisco, Tex., is constructing, extends from Cisco into the oil fields of Stephens County, a distance of about 35 miles. Terminal grounds have been secured in Cisco. Material has been purchased for the completion of the first 22½ miles of the line, while the grading of 12 miles has been completed. It is expected that trains will be run to Parks Field, 6 miles south of Breckenridge, Stephens County, by January 1, 1920. R. Q. Lee, president of the Cisco Banking Company, is president of the new line. The Wogan Construction Company, Denver, Colo., is the general contractor, and John Mead of Fort Worth, Tex., is the chief engineer.

The Cleveland, Cincinnati, Chicago & St. Louis has awarded a contract for the building of a second track between Ansonia, Ohio, and Houston, to the Walsh Construction Company, Davenport, Iowa. The work involves realinement and grade reduction, averaging 50,000 cu. yd. of grading per mile, and the construction of 11 concrete bridges.

The Portland, Astoria & Pacific is constructing a 32-mile railroad from Wilkesboro, Ore., to Keasey. The line will have a maximum grade of 1.5 per cent and maximum curvature of 8 deg. and will require approximately 7,000 cu. yd. of grading per mile. There will be 34 bridges with a total length of 13,563 ft. and one tunnel 612 ft. long on the line. The Utah Construction Company, Ogden, Utah, has been awarded the construction contract. The traffic developed will consist of mainly logs and other timber products. D. C. Eccles is president and George Scoggins of Portland, Ore., is the chief engineer of the new company. The rolling stock and motive power have already been delivered.

The Wichita Falls, Ranger & Fort Worth, a new railroad now being constructed under the direction of Jake L. Hamon of Ardmore, Okla., and Frank Kell of Wichita Falls, Tex., will extend from New Castle, Tex., to Dublin, through Breckenridge and Ranger. This project comprises the construction of 105 miles of main line and various townsites, yards and terminals at the principal oil field centers. Maney Brothers & Co., Ranger, have been awarded the contract for the grading of approximately 40 miles of the line, 10 miles of which have been completed. Location work has been started on the remainder of the line and the first tracklaying will be carried on north and south of Ranger. When completed the line will connect with the Missouri, Kansas & Texas at Wichita Falls and will traverse the oil fields of Eastland and Comanche counties. Contracts have also been awarded for the construction of five station buildings, each 30 ft. by 300 ft. Colonel J. R. Holman, recently in command of the 18th Engineers, United States Army, in France, is chief engineer of the line.

IRON AND STEEL

The Baltimore & Ohio has ordered 5,600 tons of bridge steel from the American Bridge Company for a bridge over the Allegheny River at Pittsburgh, Pa.

Mitsui & Co., Ltd., 65 Broadway, New York, has given an order to the McClintic-Marshall Company, New York, calling for 2,100 tons of steel for bridges to be built on the South Manchurian Railroad. There will be 32 spans, varying in length from 65 ft. to 110 ft. each.

The Southern Railway has ordered 2,300 tons of bridge steel from the American Bridge Company for a bridge over the Tennessee River at Chattanooga, Tenn.

The United Fruit Company has given orders to the United States Steel Products Company for 2,357 tons of 60-lb. rails for its lines in Cuba; for 2,357 tons for its lines in Costa Rica; for 2,263 tons for the Trujillo Railroad in Honduras, and for 230 tons of steel for three bridges to be erected on the Cuba lines. A contract has also been given to the Lackawanna Bridge Company for a 210-ft. steel span to be built on the Trujillo Railroad.

FOREIGN RAILWAY NEWS

In Madagascar railway lines are being built from Antsirabe to Tamatave on the east coast and from the famous lake of Alaotra to Majunga.

Colonel C. S. Coe of St. Augustine, Fla., is reported as having been appointed by the Jugo-Slav republic to take charge of railroad construction. Colonel Coe served during the war as commander of the Seventeenth Railway Engineers.

The engineers who have been surveying in Chile from Valparaiso to Santiago via Casablanca are in Santiago arranging the results of their field work. It is calculated that July next will see this survey completed if the necessary funds are forthcoming.

It is reported that England is asking for a railway concession through Esthonia to Russia in order to open up a road to the Russian market, and that negotiations are being carried on with a view to leasing the islands of Dagos and Oesel to England for the construction of a large commercial port there.

A Swiss concession for an electric narrow-gage railway between Meiringen and Guttanen has been granted to the Berne Power Works. This line will be used at first for the transport of freight in bulk necessary for the erection of the projected waterpower works at Oberhasli, and afterward will doubtless attract a fair amount of tourist traffic.

Work on the extension of the Estrade de Ferro de Nazareth in Brazil is to be resumed, according to a report from Edward Higgins, United States Consul at Bahia, as the legislature of the State of Bahia has opened a credit for the carrying on of the work. This line has in operation 221 km. (137 miles), in course of construction 30 km. (19 miles), and has surveyed 35 km. (22 miles). Work on this extension has been suspended since June, 1918, because of the failure of the state to appropriate money for its construction.

A report from a Belgian official source states that when the armistice was signed 1,500 kilometers of Belgian railways had been destroyed. Reconstruction work has been carried on so rapidly that only 300 kilometers are out of order today. Marvelous work has been accomplished on the principal railway from Ostend to Brussels and normal service is being run on the embankment line which was constructed at the time of the Ghent exhibition. All work has been more or less restored to its pre-war condition and the bridges on the Lys and Scheldt are nearing completion. In the meanwhile, temporary bridges are used to maintain the service.

The Bolivian Legation has concluded preliminary arrangements with the Argentine Government which are calculated to expedite work on the proposed railroad from Formosa, Argentina, to Cochabamba, Bolivia. The line as now planned will have 500 kilometers in Argentina and 850 in Bolivia. English engineers are already at work on the survey and construction is expected to begin as soon as the railroad material market shall have returned to normal. This line when finished will open up the rich forest lands of the Bolivian and Argentine Chaco. It will also place the Bolivian montaña in easy communication with Buenos Ayres via the extension from Formosa to Embarcacion, and will be of great advantage to Santa Cruz, an important city of eastern Bolivia. In addition, this line will provide another transcontinental railroad, for at Cochabamba a junction will be effected with the Atofagasta Railroad.

Work is in progress on the extension of the Llano Grande branch of the National Railways of Mexico, which runs from Llano Grande to Durango, a distance of 75 miles, where it connects with the old Mexican International Railroad that runs to Piedras, Negras, opposite Eagle Pass, Tex. E. E. Shaw, an American contractor who is building the road, has about 1,800 men employed in the grading and track laying work. The first 28 miles out of Llano Grande, which pene-

trates a dense forest of commercial timber, will be completed in a few weeks. The Pacific port of Mazatlan is the proposed terminus, while the surveyed route lies over the heights of the Sierra Madre range, including a drop from 10,000 feet altitude to sea level within a distance of about 30 miles. Owners of timber tracts which this road will touch are planning to install lumber mills in addition to large lumber mills established several years ago. The Monterey Iron & Steel Co. is supplying the rails for this road.

The Mexican National Railroads have suffered serious losses in the recent storms and it is estimated that, without counting the material the roads have on hand at the present time, an additional expenditure of 200,000 pesos will be necessary for ties and an even greater expenditure for rails and other supplies. The lines in the State of Chihuahua, which have been more seriously damaged than any other section, have exhausted the material stored in the northern cities. The President of the Republic, according to Paulino Fontes, Director of the Railroads, has decided upon an appropriation of money in addition to that received from freight and passenger transportation for immediate repair of damages which have been wrought. In the division from Jiminez to Chihuahua the storm destroyed more than 50 bridges, large and small, and almost as many more have been destroyed in other sections of the country. The large Ortiz bridge, in the State of Chihuahua, will have to be completely rebuilt. In order that the bridge may resist the overflows of the River Concha, it is planned to construct the new bridge entirely of concrete. As it will be necessary to construct embankments to support the roadbed, which has been completely obliterated in many places for miles, the repairing of the bridges will be very expensive. The President has authorized Eng. Angel Pembert to investigate the conditions under which the work may be carried out and the probable expenditure necessary.

EXPORTS OF TRACK MATERIAL

Exports of track material in July were considerably less than those of any previous month this year. Rails exported amounted to 32,707 tons valued at $1,870,583, as compared with 67,028 tons valued at $4,208,872 in June. The totals for July as compiled by the Division of Statistics of the Bureau of Foreign and Domestic Commerce are as follows:

	Spikes		Steel Rails		Switches, Frogs, Splice Bars, Etc.
	Pounds	Dollars	Tons	Dollars	Dollars
Belgium	527,871	37,117	1,163	67,279	27,586
France	149,730	5,636	1,074	66,574	20,529
Italy	.....	.....	.....	.....	909
Netherlands	.....	.....	214	17,952	6
Norway	.....	.....	33	2,000	.....
Portugal	.....	.....	811	44,960	5,640
Sweden	.....	.....	202	17,136	1,433
England	.....	.....	1,992	114,998	4,101
Scotland	.....	.....	200	12,803	602
British Honduras	.....	.....	.....	.....	71
Canada	24,675	764	356	20,352	28,044
Guatemala	200	10	.....	.....	.....
Honduras	10,600	436	341	18,459	1,568
Panama	.....	.....	.....	.....	820
Salvador	1,000	70	8	1,000	2,856
Mexico	515,498	23,734	1,992	78,299	44,762
Newfoundland and Labrador	.....	.....	.....	.....	196
Jamaica	.....	.....	145	8,540	139
Trinidad and Tobago	.....	.....	.....	.....	23
Other British West Indies	2,000	100	31	1,500	42
Cuba	507,724	20,771	3,077	144,091	30,241
French West Indies	.....	.....	120	5,040	.....
Haiti	30,000	1,053	.....	.....	.....
Dominican Republic	.....	.....	3	244	.....
Bolivia	.....	.....	.....	.....	4,480
Brazil	342,943	20,943	10	359	29,368
Chile	44,400	1,850	.....	.....	1,760
Colombia	59,892	3,379	128	7,202	2,527
Ecuador	46,000	1,600	.....	.....	.....
Peru	.....	.....	.....	.....	3,911
Venezuela	.....	.....	.....	.....	234
China	.....	.....	933	70,197	.....
Japanese China	456,330	20,899	772	66,748	2,400
British India	.....	.....	24	1,677	1,087
Straits Settlements	.....	.....	191	18,000	420
Other British East Indies	.....	.....	52	3,486	.....
Dutch East Indies	561,124	46,270	5,613	305,858	29,002
Japan	363,940	11,634	12,770	742,928	33,989
Siam	134,000	11,291	.....	.....	.....
Philippine Islands	32,000	1,497	452	32,901	10,188
British South Africa	.....	.....	.....	.....	298
Total	3,803,927	209,054	32,707	1,870,583	289,232

SUPPLY TRADE NEWS

GENERAL

The Penn General Supply Company, Pittsburgh, Pa., is inquiring for from 30 to 40 steel railway velocipedes.

The Bucyrus Steam Shovel Company, South Milwaukee, Wis., is building an addition to its Evansville, Ind., plant which will cost approximately $500,000.

The Duncan Lumber Company, Portland, Ore., has been appointed the exclusive sales agent of the Luedinghaus Lumber Company, Dryad, Wash., and the Meskill Lumber Company, Meskill, Wash.

The Lidgerwood Manufacturing Company, New York, has opened a branch office in the Hammond Building, Detroit, Mich. **R. S. Hutchinson,** formerly in the Philadelphia office, will have charge of the Detroit office under the jurisdiction of **F. B. Knight** of the Chicago office.

The Railway Lock-Spike Company, of Atlanta, Ga., which plans to manufacture railway spikes and other railway supplies, has been chartered with $300,000 capital and the privilege of increasing to $1,000,000. H. E. Harris, W. E. Paschall and J. J. Casteel are the incorporators.

The Carborundum Company, Niagara Falls, N. Y., has opened a branch office and warehouse in the Burkhardt Building, Second and Larned streets, Detroit, Mich. This branch is under the management of **Anthony Dobson,** who will have charge of the Detroit sales district.

The Chicago Heights (Ill.) plant of the Chicago Pneumatic Tool Company has been purchased by the Giant Truck Corporation. Equipment other than the chassis manufacturing machinery of the Chicago Pneumatic Tool Company has been removed to its Cleveland (Ohio) plant.

Joseph T. Ryerson & Son Co., Chicago, has purchased a block of property adjoining its plant in that city with an area of 380,290 sq. ft. A brick foundry building valued at $100,000, located on the property, and at present occupied by the Crane Company, Chicago, will be used by the purchasers as the first unit of an addition to their facilities.

The Keller Pneumatic Tool Company, Chicago, has opened branch offices in the following cities: Birmingham, Ala., Jefferson County Bank Building, under the management of **H. I. Kahn;** Salt Lake City, Utah, Newhouse Building, under the management of the **C. H. Jones Company;** San Francisco, Cal., Los Angeles, Cal., and Portland, Ore., all under the management of the **Eccles & Smith Co.,** San Francisco.

Mudge & Co., Chicago, has appointed the Canuck Supply Company, Montreal, Ont., as its Canadian sales agent. This company has completed the construction of its new railway motor car plant at Chicago, and **C. P. Benning,** assistant general manager, with headquarters at Chicago, has been appointed factory manager.

The Permanent Railway Tie Corporation has been incorporated in Delaware with a capital of $5,000,000. The office of the corporation in Delaware is with the United States Corporation Company, 311 South State street, Dover. The following incorporators are all residents of New York: Joseph A. Silver, 835 West One Hundred and Seventy-eighth street; Edwin L. Carpenter, 140 West Sixty-ninth; Charles H. Phelps, Elmer E. Studley and Lawson Sanford, 17 Battery Place.

The Buda Company has opened branch offices in Buenos Aires, Brazil, London, England, and Paris, France. **J. H. Maher,** departmental manager at the Buda Company's Harvey (Ill.) plant, has been appointed sales representative in charge of the Buenos Aires office, with temporary headquarters at the Savoy Hotel, Buenos Aires. **Colonel R. S. Chapman,** recently discharged from the British army, has been appointed sales representative and manager of the London office, which is at 10 Gloucester Place, Portman Square, London, E. I. **A. Conro Fiero,** connected with the sales

force of the home office of the Buda Company, has been appointed sales representative in charge of the Paris office. His headquarters will be 29 Rue de la Rochefaucauld, Paris.

PERSONAL

C. E. Anderson, formerly assistant to the vice-president of the American Locomotive Company, has been appointed eastern sales manager of the Duff Manufacturing Company, Pittsburgh, Pa., with headquarters at its eastern sales offices, 50 Church Street, New York.

Robert N. Dickman, mining engineer on the staff of Robert W. Hunt & Co., engineers, Chicago, died on September 14 at La Jolla, Cal., following an operation. Mr. Dickman was formerly associated with the mining engineering firm of Dickman & MacKenzie.

Louis W. Ulmer has been appointed eastern railway sales representative of the Detroit White Lead Works, with office in Philadelphia, Pa. Mr. Ulmer has recently been released from his duties in the United States Marine Corps. He was connected with the Detroit White Lead Works before he entered military service.

Earl E. Eby, sales manager of the Industrial Bearings division of the Hyatt Roller Bearing Company, with headquarters at New York, has been appointed to the Board of Directors of Hyatt, Ltd., a new company formed to market the Hyatt bearing in Europe. Mr. Eby will devote his entire time to this work with headquarters in New York. **C. O. Helmstaedter,** formerly Chicago manager, has been promoted to the position of sales manager, succeeding Mr. Eby.

O. A. Phenix, associated with the sales department of the United States Graphite Company, Saginaw, Mich., with office at Birmingham, Ala., has been promoted to advertising manager with office at Chicago, succeeding **George A. Cooper,** who has been appointed advertising and export manager of the Detroit Lubricator Company, Detroit, Mich., with office in that city.

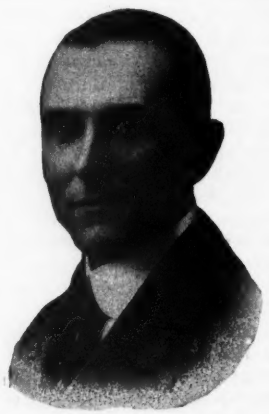
E. G. Buckwell, secretary and manager of sales of the Cleveland Twist Drill Company, Cleveland, Ohio, has just returned from a three months' visit to England and the Continent, where he has made a thorough trade investigation in conjunction with the Cleveland Twist Drill Company of Great Britain, Ltd., London, the European branch of the Cleveland Twist Drill Company.

S. C. Amsden, advertising manager of Mudge & Co., Chicago, with headquarters in that city, has been appointed district manager of the southwestern territory, with headquarters at St. Louis, Mo. **Jean K. Vanatta,** service manager at Chicago, has been appointed district manager of the central territory, with the same headquarters.

L. R. Custer, formerly development engineer for the Midvale Steel and Ordnance Company, has been elected a vice-president of the Cambria Steel Company. He was born in Altoona in 1873 and graduated from Cornell University in 1902. His first work was as a machinist for the Pennsylvania Railroad. He later was in the employ of the Baldwin Locomotive Works and then served as a draftsman for the Jones & Laughlin Steel Co., Pittsburgh. He entered the service of the Homestead Steel Company as a construction foreman and in 1914 was made superintendent of the armor plate department. During the early part of the war he developed the ordnance department of that company. Shortly before the close of the war he left the Homestead Company to go with the Midvale Company.

Major C. E. Smith, formerly consulting engineer at St. Louis, Mo., has been discharged from the Construction Division of the United States army and has resumed the management of the firm of C. E. Smith & Co., consulting engineers, with headquarters at St. Louis. A Chicago office has been established in the Steger Building in charge of **W. C. Curd,** who was engaged for a number of years in general railway work and was formerly drainage and water service engineer for the Missouri Pacific with office at St. Louis and more recently was connected with the Layne & Bowler Co., Memphis, Tenn., and the Wm. Graver Tank Works, East Chicago, Ill., in the department of water supply and purification. **W. B. Hudson,** assistant bridge engineer of the Missouri Pacific, with office at St. Louis, Mo., has resigned to become associated with C. E. Smith & Co.

H. W. Ross has been elected vice-president of Templeton, Kenly & Co., Ltd., Chicago, manufacturers of Simplex jacks, and assumed his duties with that company on September 29.



H. W. Ross

In 1916, Mr. Ross was designated as engineer in charge of installing a bureau of standards for the Quartermaster Corps, U. S. A., for the purpose of testing and selecting various motor machine shop tools and accessory equipment for the United States Government. In 1917, he was called to Washington, D. C., to purchase machinery, tools and auto accessories for use of the Motor Transport Corps in France, on August 1, 1917, receiving his commission as captain, later being promoted to major. He went overseas, where he was connected with the Motor Transport Corps in an engineering and purchasing capacity. He was later sent to Spain and Portugal in connection with the General Purchasing Board. After the close of hostilities Major Ross was selected as officer in charge of sales of Motor Transport Corps equipment in connection with the United States Liquidation Commission, and he had charge of the appraisal and selling of the vast quantity of motor cars, trucks, motorcycles and machinery that the Government had accumulated in France. Major Ross returned to the United States on September 15, and at his request was mustered out of the service soon thereafter. Mr. Ross' new work covers the general sales management of Simplex jacks, and he will give particular attention to the Simplex pole pulling and pole straightening and special emergency jacks.

TRADE PUBLICATIONS

Locomotive Repair Shop Design.—The Austin Company, Cleveland, Ohio, has issued an attractive bulletin containing a reprint of an article published in the August 8, 1919, issue of the Railway Age under the title of "The Design of Locomotive Repair Shops," by Gustave E. Lemmerich.

Milliken Buildings.—The Milliken Brothers Manufacturing Company, Inc., New York, has issued catalogue No. 10, illustrating and describing Milliken buildings and steel specialties, including transmission towers, radio towers and pinlock poles. This booklet is supplemented by Catalogue No. 11, an erection handbook which is designed as a guide for the erection of the buildings.

Blaw Building Forms.—The Blaw-Knox Company, Pittsburgh, Pa., has recently issued a 40-page catalog describing the Blaw system for building construction which is handled by that company since its acquisition of the patents, personnel and equipment of the Uniform Company of Boston. This catalogue describes in detail the application of these forms to various classes of concrete building.

Centrifugal Pump Sales Service Data.—The Goulds Manufacturing Company, Seneca, N. Y., has compiled a large amount of information on the theory, design and testing of centrifugal pumps, originally sent out in the form of sales letters to its own men, into Bulletin No. 122. There are 18 chapters dealing with methods of use, characteristics, effects of changes, performances, proper installation and operation, etc., with illustrations and a considerable number of data curves.